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PATENT
29248/AP01952

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:

DOUROS et al.

Serial No.: 09/976,565

Filed: October 12, 2001

Title: SYSTEM AND METHOD FOR DRIVER PERFORMANCE IMPROVEMENT

Group Art Unit: 3661

Examiner: M. Marc-Coleman

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail, in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this date:

June 8, 2004

Anthony G. Sitko
Registration No. 36,278
Attorney For Applicants

DECLARATION OF DOUROS et al.
UNDER 37 C.F.R. § 1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

We hereby declare as follows:

1. We are the original, joint inventors of the subject matter claimed and disclosed in the above-captioned application.

2. We submit this Declaration for the purpose of providing evidence that the subject matter claimed in the above-captioned application, U.S. Patent Application Serial No. 09/976,565 (hereinafter, "the '565 application"), was conceived in the United States of America as of a date prior in time to February 10, 2000.

3. We have been informed that Van Der Voort, WO 00/07150 (hereinafter, "Van Der Voort"; see Exhibit A), was cited against the claims pending in the '565 application in an Office Action mailed January 9, 2004.

4. Further, we have been informed that the publication date of Van Der Voort is February 10, 2000.

5. To establish a date of conception of the '565 invention prior to February 10, 2000, we provide several documents describing the development of our Driver Advocate System, the name used to refer to our invention as recited by the claims in the '565 application.

Included herein as evidence of a prior date of conception are the following:

a copy of internal meeting notes from a meeting occurring prior to February 10, 2000 ("**Meeting Notes**") describing our development of the Driver Advocate System, as Exhibit A;

a copy of a status report, with attached notes, given by Robert Leivian prior to February 10, 2000 ("**Status Report**") showing the Driver Advocate system, as Exhibit B;

a copy of a slide presentation of the Driver Advocate System ("**Slide Presentation**") dated prior to February 10, 2000, as Exhibit C;

a copy of a power point presentation entitled Single Mission Challenge ("**Single Mission Challenge** ") with a screen shot of its file properties (dates redacted as permitted by MPEP § 715.07), as Exhibit D;

a single slide from a confidential Motorola Human Interface Lab presentation ("**HIL Presentation**") with a screen shot of its file properties (dates redacted as permitted by MPEP § 715.07), as Exhibit E;

a power point presentation from our Human Interface Laboratory entitled "Wings - Access to the World in a Human Friendly Way" ("**HIL II Presentation**"), as Exhibit F;

a power point presentation from our Autobody, Chasis and Sensors Division entitled Driver Advocate ("**Driver Advocate Roadmap**") with a screen shot of its file properties (dates redacted as permitted by MPEP § 715.07), as Exhibit G;

an e-mail by Donald Remboski introducing the Driver Advocate System and presenting the **Driver Advocate Roadmap** file (dates redacted as permitted by MPEP § 715.07), as Exhibit H;

a draft of a document entitled "Preliminary Draft - Driver Advocate Components and Issues" ("**Driver Advocate Components and Issues**") with a screen shot of its file properties (dates redacted as permitted by MPEP § 715.07), as Exhibit I;

a draft of a document entitled "Driver Advocate Scenarios" ("**Driver Advocate Scenarios**") with a screen shot of its file properties (dates redacted as permitted by MPEP § 715.07), as Exhibit J;

an e-mail by Donald Remboski setting a meeting for the driver scenario presentations (dates redacted as permitted by MPEP § 715.07), as Exhibit K; and

a document presented to General Motors ("**GM Presentation**"), including a description of the Driver Advocate a screen shot of its file properties (dates redacted as permitted by MPEP § 715.07), as exhibit L.

6. The **Meeting Notes** document was created prior to February 10, 2000.

The **Status Report** document was presented prior to February 10, 2000.

The **Slide Presentation** was created prior to February 10, 2000..

The **Single Mission Challenge** document was created prior to February 10, 2000.

The **HIL Presentation** was created prior to February 10, 2000.

The **HIL II Presentation** was created prior to February 10, 2000.

The **Driver Advocate Roadmap** was created prior to February 10, 2000.

The **Driver Advocate Components and Issues** was created prior to February 10, 2000.

The **Driver Advocate Scenarios** document was created prior to February 10, 2000.

The **GM Presentation** was created prior to February 10, 2000.

7. The documents show the estimation of operator cognitive load based on vehicle operating data, operator activity data, vehicle environment data and operator condition data and prioritizing vehicle information based on operator cognitive load, as recited by the pending claims of the '565 application.

Specifically, estimating driver cognitive load is shown in the **Meeting Notes** (Exhibit A) at least on page 2 under "Exercised v. Actual Cognitive Load," on page 3 under "Cognitive Load Driver Advocate" (showing measuring arousal and an experiment determining cognitive load of books on tape) and "Warning Interfaces/Types" (showing cognitive experiments to determine any adverse effects of "too much" intelligence). Estimating cognitive load is also shown at least on page 3 of the **Status Report** (Exhibit B) under "Driver State," on page 1 of the **Slide Presentation** (Exhibit C) (showing consideration of driver personality profile and emotional state), on page 6 of the **Single Mission Challenge** (Exhibit D), by the **HIL Presentation** (Exhibit E) (showing the need for a cognitive load study), and on page 5 of the **HIL II Presentation** (Exhibit F) (showing cognitive interfaces).

Prioritizing vehicle information based on operator cognitive load is shown at least on page 2 of the **Meeting Notes** under "Vigilance Task," page 6 of the **Single Mission**

Challenge (Exhibit D), at least on pages 2-3 of the **Driver Advocate Roadmap** (Exhibit G), page 4 of **Driver Advocate Components and Issues** (Exhibit I) under "Questions about Technical Feasibility", page 1 of **Driver Advocate Scenarios** (Exhibit J) under "General Principals" and page 6 of **Driver Advocate Scenarios** under "Scenario 4 - Prioritisation of Alerts."

Inputs to the calculation of operator cognitive load such as vehicle operating data, operator activity data, vehicle environment data, and operator condition data are shown at least on pages 2-4 of the **Status Report** (Exhibit B), pages 1-2 of the **Slide Presentation** (Exhibit C), the **HIL Presentation** (Exhibit E), page 5 of the **HIL II Presentation** (Exhibit F), pages 4-8 of the **Driver Advocate Roadmap** (Exhibit G) and at least on pages 1-3 of the **Driver Advocate Components and Issues** (Exhibit I).

8. The fusion of sensor data for determining the immediate context of a driving task and using that context to prioritize information presented to the driver is also shown by the documents. Specifically the **Status Report** (Exhibit B) shows that fusion of sensor data involves integrating various sensor readings including vehicle operating data, operator activity data, vehicle environment data and operator condition data. Fusion of sensor data is further supported on pages 1-2 of the **Slide Presentation** (Exhibit C), pages 4-5 of the **Driver Advocate Roadmap** (Exhibit G), pages 1-3 of the **Driver Advocate Components and Issues** (Exhibit I), and on pages 5-7 of the **GM Presentation** (Exhibit L).

9. Before February 10, 2000, we understood and contemplated that operator cognitive load could be used to increase safety and improve driver performance by using cognitive load to manage and prioritize information presented to the driver. We further understood and contemplated that operator cognitive load could be estimated by analyzing

vehicle roadway condition data, vehicle condition data, operator activity data and operator condition data.

10. Before February 10, 2000, we understood and contemplated that fusion of sensor data could be used to determine the context of a driving task and that this driving context could then be used to prioritize information presented to the driver.

11. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of first inventor Kenneth Douros	
Second inventor's signature	Date 5/30/04
Residence South Barrington, Illinois	
Citizenship US	
Mailing Address 10 Forest Lane South Barrington, Illinois 60010	

Full name of second inventor Judith Lee Gardner	
Third inventor's signature	Date
Residence Detroit	
Citizenship US	
Mailing Address 7466 Rutherford Detroit, Michigan 48228	

Full name of third inventor, if any Robert Michael Gardner	
Fourth inventor's signature	Date
Residence Gilbert, Arizona	
Citizenship US	
Mailing Address 829 West Emerald Island Drive Gilbert, Arizona 85233	

Full name of fourth inventor, if any Joshua B. Hurwitz	
Fifth inventor's signature	Date
Residence Niles, Illinois	
Citizenship US	
Mailing Address 8452 N. Ozark Ave. Niles, Illinois 60714	

Full name of first inventor Kenneth Douros	
Second inventor's signature	Date
Residence South Barrington, Illinois	
Citizenship US	
Mailing Address 10 Forest Lane South Barrington, Illinois 60010	

Full name of second inventor Judith Lee Gardner	
Third inventor's signature Judith Lee Gardner	Date 7 June 2004
Residence Detroit	
Citizenship US	
Mailing Address 7466 Rutherford Detroit, Michigan 48228	

Full name of third inventor, if any Robert Michael Gardner	
Fourth inventor's signature	Date
Residence Gilbert, Arizona	
Citizenship US	
Mailing Address 829 West Emerald Island Drive Gilbert, Arizona 85233	

Full name of fourth inventor, if any Joshua B. Hurwitz	
Fifth inventor's signature	Date
Residence Niles, Illinois	
Citizenship US	
Mailing Address 8452 N. Ozark Ave. Niles, Illinois 60714	

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Second inventor's signature	Date
Residence South Barrington, Illinois	
Citizenship US	
Mailing Address 10 Forest Lane South Barrington, Illinois 60010	

Full name of second inventor Judith Lee Gardner	
Third inventor's signature	Date
Residence Detroit	
Citizenship US	
Mailing Address 7466 Rutherford Detroit, Michigan 48228	

Full name of third inventor, if any Robert Michael Gardner	
Fourth inventor's signature Robert Michael Gardner	Date 5/24/04
Residence Gilbert, Arizona	
Citizenship US	
Mailing Address 829 West Emerald Island Drive Gilbert, Arizona 85233	

Full name of fourth inventor, if any Joshua B. Hurwitz	
Fifth inventor's signature	Date
Residence Niles, Illinois	
Citizenship US	
Mailing Address 8452 N. Ozark Ave. Niles, Illinois 60714	

Full name of first inventor Kenneth Douros	
Second inventor's signature	Date
Residence South Barrington, Illinois	
Citizenship US	
Mailing Address 10 Forest Lane South Barrington, Illinois 60010	

Full name of second inventor Judith Lee Gardner	
Third inventor's signature	Date
Residence Detroit	
Citizenship US	
Mailing Address 7466 Rutherford Detroit, Michigan 48228	

Full name of third inventor, if any Robert Michael Gardner	
Fourth inventor's signature	Date
Residence Gilbert, Arizona	
Citizenship US	
Mailing Address 829 West Emerald Island Drive Gilbert, Arizona 85233	

Full name of fourth inventor, if any Joshua B. Hurwitz	
Fifth inventor's signature Joshua B Hurwitz	Date May 27, 2004
Residence Niles, Illinois	
Citizenship US	
Mailing Address 8452 N. Ozark Ave. Niles, Illinois 60714	

Full name of fifth inventor, if any Robert H. Leivian	
Sixth inventor's signature Robert H. Leivian	Date JUNE 2 2004
Residence Tempe, Arizona	
Citizenship US	
Mailing Address 1401 E. Palomino Drive Tempe, Arizona 85284	

Full name of sixth inventor, if any Jens Nagel	
Seventh inventor's signature	Date
Residence San Francisco, California	
Citizenship US	
Mailing Address 183 Parnassus Ave., #5 San Francisco, California 94117	

Full name of seventh inventor Donald Remboski	
Sole or first inventor's signature	Date
Residence Dearborn, Michigan	
Citizenship US	
Mailing Address 160 Golf Crest Drive Dearborn, Michigan 48124	

Full name of fifth inventor, if any Robert H. Leivian	
Sixth inventor's signature	Date
Residence Tempe, Arizona	
Citizenship US	
Mailing Address 1401 E. Palomino Drive Tempe, Arizona 85284	

Full name of sixth inventor, if any Jens Nagel	
Seventh inventor's signature J. Nagel	Date 6/3/2004
Residence San Francisco, California	
Citizenship ~~US~~ German JN	
Mailing Address ~~183 Parnassus Ave., #5~~ ~~San Francisco, California 94117~~ 725 Burnett Ave. #6 JN San Francisco, CA 94131	

Full name of seventh inventor Donald Remboski	
Sole or first inventor's signature	Date
Residence Dearborn, Michigan	
Citizenship US	
Mailing Address 160 Golf Crest Drive Dearborn, Michigan 48124	

Application No. 09/976,565 29248/AP01952

Full name of fifth inventor, if any Robert H. Leivian	
Sixth inventor's signature	Date
Residence Tempe, Arizona	
Citizenship US	
Mailing Address 1401 E. Palomino Drive Tempe, Arizona 85284	

Full name of sixth inventor, if any Jens Nagel	
Seventh inventor's signature	Date
Residence San Francisco, California	
Citizenship US	
Mailing Address 183 Parnassus Ave., #5 San Francisco, California 94117	

Full name of seventh inventor Donald Remboski	
Sole or first inventor's signature	Date 6/1/04
Residence Dearborn, Michigan	
Citizenship US	
Mailing Address 160 Golf Crest Drive Dearborn, Michigan 48124	

Full name of eighth inventor, if any David John Wheatley	
Eighth inventor's signature	Date 26 May 2004
Residence North Barrington, Illinois	
Citizenship ~~USA~~ UK	
Mailing Address 25318 Barsumian Drive North Barrington, Illinois 60010	

Full name of ninth inventor, if any Clifford A. Wood	
Ninth inventor's signature	Date
Residence Tempe, Arizona	
Citizenship US	
Mailing Address 7227 S. Bonarden Tempe, Arizona 85283	

737554

Full name of eighth inventor, if any David John Wheatley	
Eighth inventor's signature	Date
Residence North Barrington, Illinois	
Citizenship US	
Mailing Address 25318 Barsumian Drive North Barrington, Illinois 60010	

Full name of ninth inventor, if any Clifford A. Wood	
Ninth inventor's signature Clifford A. Wood	Date 5/24/04
Residence Tempe, Arizona	
Citizenship US	
Mailing Address 7227 S. Bonarden Tempe, Arizona 85283	

737554

MEETING PLANNER

Title: Telematics Scenario

Objective: Brainstorm alternative future scenarios from end user perspective
- telematics - communications - infotainment - driver assistance

Date: ___ Time: ___ Location: ___

SCHEDULED TIME			ACTUAL TIME		
START	END	TOTAL	START	END	TOTAL
9:00					

PARTICIPANTS

1. Keith Bergelt - Facilitator
2. Mike Gardner - Machine Learning
3. Janet Cahn - Speech
4. Tom Mactavish - Human Interface
5. Lea Adams - Cognitive
6. Norm - Innovator
7. Jean Canavan - Cult. Anthropology
8. Shri Jambhekar - Prod. Des
9. Mark Randolph - Speech
10. Don Remboski - Auto Tech
11. Judy Gardner - "Techno Grouch"
12. Craig Bezek - Auto Technology
13. Jens Nagel - Human Factors
14. David Wheatley - Human Factor
15. Ken Douros - Cognitive
16. ___
17. ___
18. ___

ITEMS TO BE DISCUSSED

1. (See Agenda Sheet & Slide Copies)
2. Tuesday
3. 9:00 Context for Driver Advocate
4. 9:30 Telematics Promo Video
5. 9:45 Establish shared vision of the
6. future
7. • Visit to CoPilot usability test site
8. • P.M. Scenario planning
9. ___
10. Wed.
11. -Scenario Planning continues-
12. ___
13. ___
14. ___
15. ___
16. ___
17. ___
18. ___

NOTES, MINUTES, FOLLOW-UP

- Introduction - David Wheatley
- Bus. Unit Overview - Don Remboski
- Video - TCG Vision of Telematics
  - Roadside Assistance - GPS & Wireless
  - Convenience Services - Access to Auto Bus (Info on mechanics)
  - Safety & Dependibility -
  - Navigation - Real-Time Traffic & Servers
  - Remote Programming -
  - Personalized Information - Intuitive Speech Interface
  - Convenience & Entertainment - Seamless Integration with Wireless Devices
- Some Orientation Discussion - Keith Bergelt
- Personal Introductions
- Future Archeology/Future Visioning
  - Trend discussions (free form style - see "Critical Issues & Innovative Ideas")
- "Scenario Planning" group sessions
- "Action Item" Planning

Critical Issues	Innovative Ideas
Intrusive Technology →	I Individual can control by: • personal usage disciplines • technology options to mitigate this. • selective connection
Unsafe Technology? → - trend is safety issue coming under greater scrutiny	• deliver technology that has been scrutinized for safety.
	Service - Where am I? Not navigation to. - Sensor the vehicle; not the roads. - "Black Box" recorder
Road Rage? → - Communicating with "dangerous" people	cause: Efficiency of traffic flow? - communicating car for car geographically close? [100 talk about radios and find out what happens] - selective anonymity (- additional communication good/bad ← social research (- technology options to mitigate - passive or passifying communication
Vigilance Task (Driving is a Vig. Tsk) →	Driver Advocate - modify infotainment input based on (vigilance interruption - driving task. increase load) - use sensors to recognize situation sooner - advocate then reduces - "infotainment load"
~~Perceived~~ vs Actual Cognitive Load Cell Phone Conversation	- Any way to communicate situation awareness to other party so they themselves can ~~change their~~ be sensitive to your driving predicimate - Advocate switches modes ~~to stay~~ How long? below threshold of Cog. Load

JOURNAL

Critical Issues	Innovative Ideas
Cog. Load Driver Advocate	- measure arousal and modify driver advocate accordingly - Stanford work on Media might be associated to our work.
(Cell Phone)	- half duplex conversation capability - experiment: cognitive load of books on tape.
Warning Interfaces / Type - voice warnings can be irritating - intelligent interfaces may be seen as human, consequently, high expectations may have adverse effects.	→ warning lights, tones → cognitive experiments needed to determine any adverse effects of "too much" intelligence.
AIEG Power PC ~~Unix~~ QNix Road Hardened	
Follow-on Action (see action Items)	

Have you indexed?

Action Items	Responsibility	Time Frame
Find "common" software platforms - Power PC Qnix - Mobil GT - TCG Qnix Effort	Mike G. / Bob L.	Redacted
Research / Realization Proposal - Jan	Mike G. / Mark R.	
Scenarios - Critical Issue - Story Boards	Dave W. (illegible) Shri J & Dave W.	
University of Iowa Simulator	Dave W.	
Talk to Mot Customers (set meeting) Lear JCI GM	Don R.	
MIT Roz Pickard Research Influence	Dave W. (Ken D., Jen , Janet C.)	
Intelligent Systems Relationships with Univ.	Mike G.	

Have you indexed?

Bob's Status Report:

Research Projects

Telematics OS and Device Simulator

- first draft of Driver Advocate block diagram, state taxonomy and first several scenarios, and action hierarchy

Personality Profile

- -nothing-

Heads Up Displays

- Started some user scenarios for driver advocate work

Support of other HIL Groups

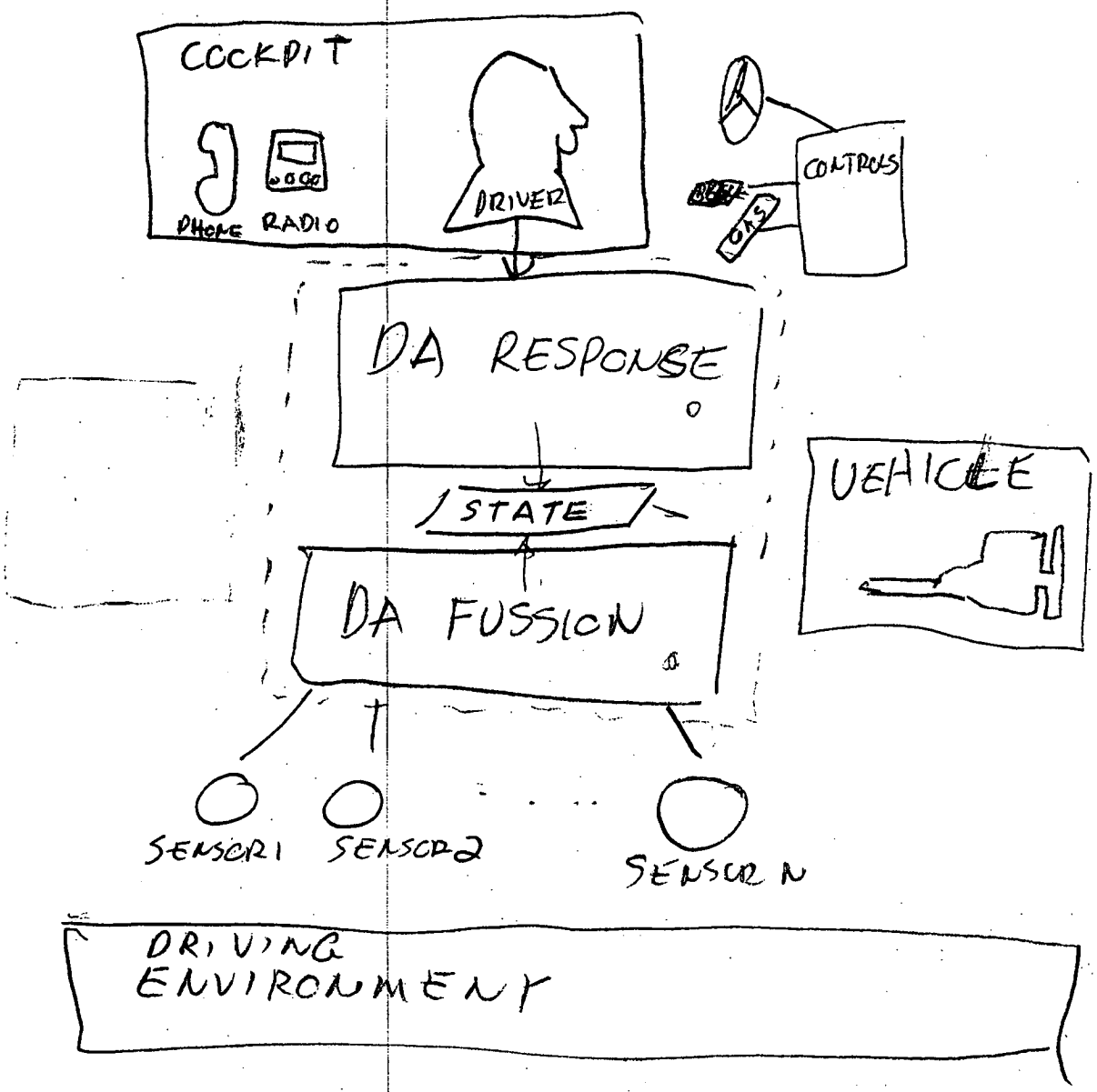
- Worked with Kumar to pursue Cordex for external development and use
- IT committee – nothing

Individual Research/Education Pursuits

- general reading and 'surfing' on user interface techniques
- registered and made plane/hotel reservations for SD2000 *software development conference

Administration

- setup for 2way pager -- my pin is: 7597854
- setup my public Netscape calendar
- SD2000 conference
- Main vacation Redacted


COCKPIT
PHONE
RADIO
DRIVER
CONTROLS
BRAKE
GAS
DA RESPONSE
STATE
DA FUSSION
VEHICLE
SENSOR1
SENSOR2
SENSOR N
DRIVING
ENVIRONMENT

480 874 1311

SIAICS

VEHICLE: ENGINE: OK, SUBSTATES: OIL, WATER, ELE
DEGRADED
DISABLED: S
TIRES: OK, LOW, FLAT
FUEL: ~~PLENTY~~ OK
LOW
"FUMES"
OUT

DOORS: CLOSED, AJAR, OPEN
LOCKS: YES, NO
SEAT BELTS: OFF, WEARING

DRIVING ENVIRONMENT
SPEED
MOTION
ROAD: SINGLE, MULTI
WEATHER: NORMAL
DEGRADED: RAIN, SNOW, ICE
LIMITED VISABILITY
TRAFFIC: ALONE
SPARCE
BUSY
RUSH HOUR
SPEED LIMIT: X X
TIME OF DAY DAY, DUSK, NIGHT
EXTERANL WARNING: NONE,

COCKPIT
OCCUPANTS: DRIVER ONLY
+PASSENGERS
+KID

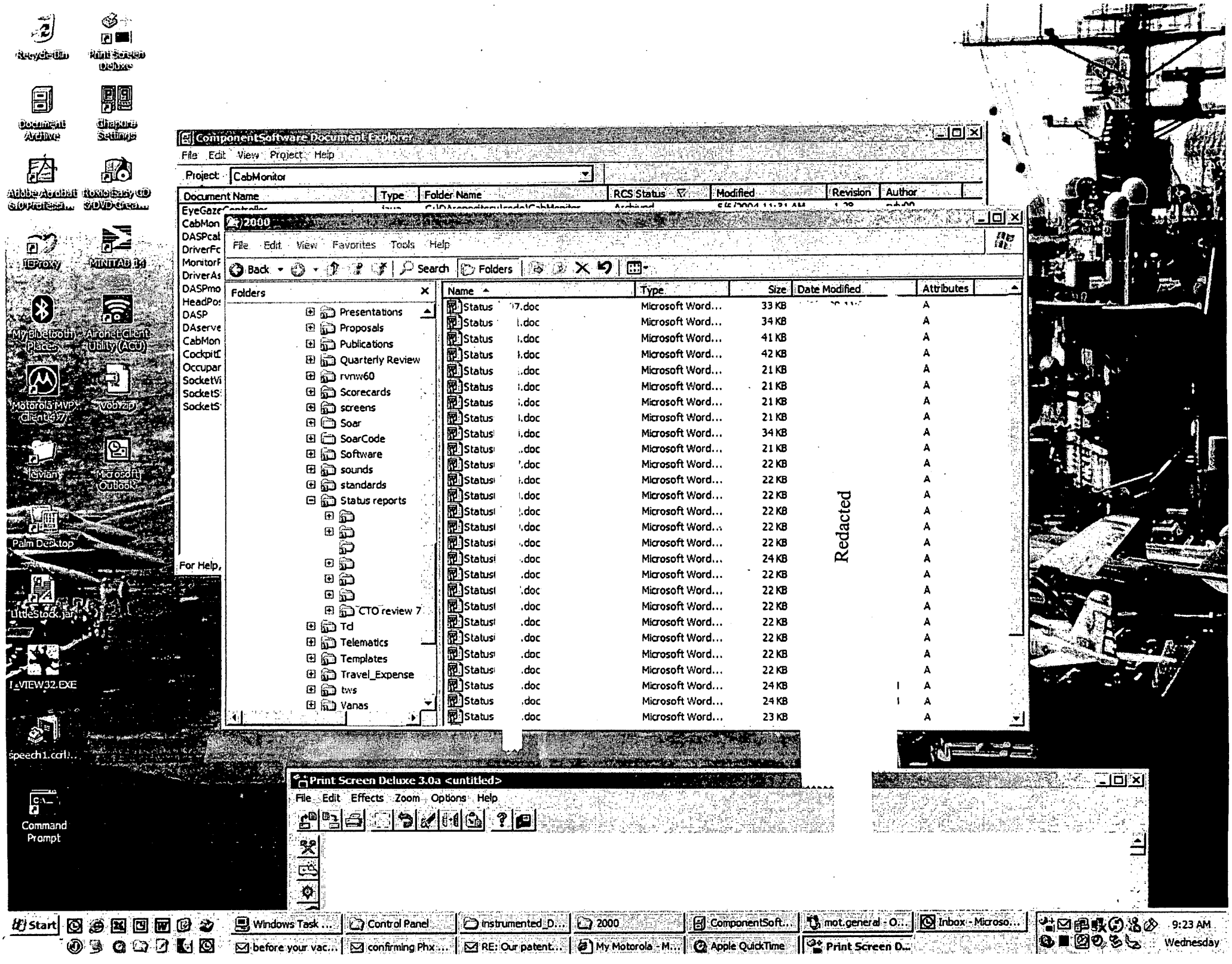
PHONE
OFF INCOMING CALL
ACTIVE
ON HOLD

RADIO: ON MUTED, OFF
AC: ~~TEMP~~

DRIVER
STATE: OK
DROWSEY
IMPAIRED
ATTENTION: OK, SPLIT, EXTERANL
NAV MODE: SELF, ROUTE ACTIVE, DETOUR

MOTION

STOPPED
MOVING
DRIFTING, EXAG DRIFT
LANE CHANGE (INTENSITY
PASSING
LANE DEPARTURE
ROAD DEPARTURE
ROAD RETURN
DISABLED
ACCIDENT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Publications
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SoarCode
Software
sounds
standards
Status reports
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Recycle Bin
Print Screen Deluxe
Document Archive
Capture Settings
Adobe Acrobat 6.0 Professi...
Roxio Easy CD & DVD Creat...
IEProxy
MINITAB 14
My Bluetooth Places
Aironet Client Utility (ACU)
Motorola MVP Client 4.97
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Avian
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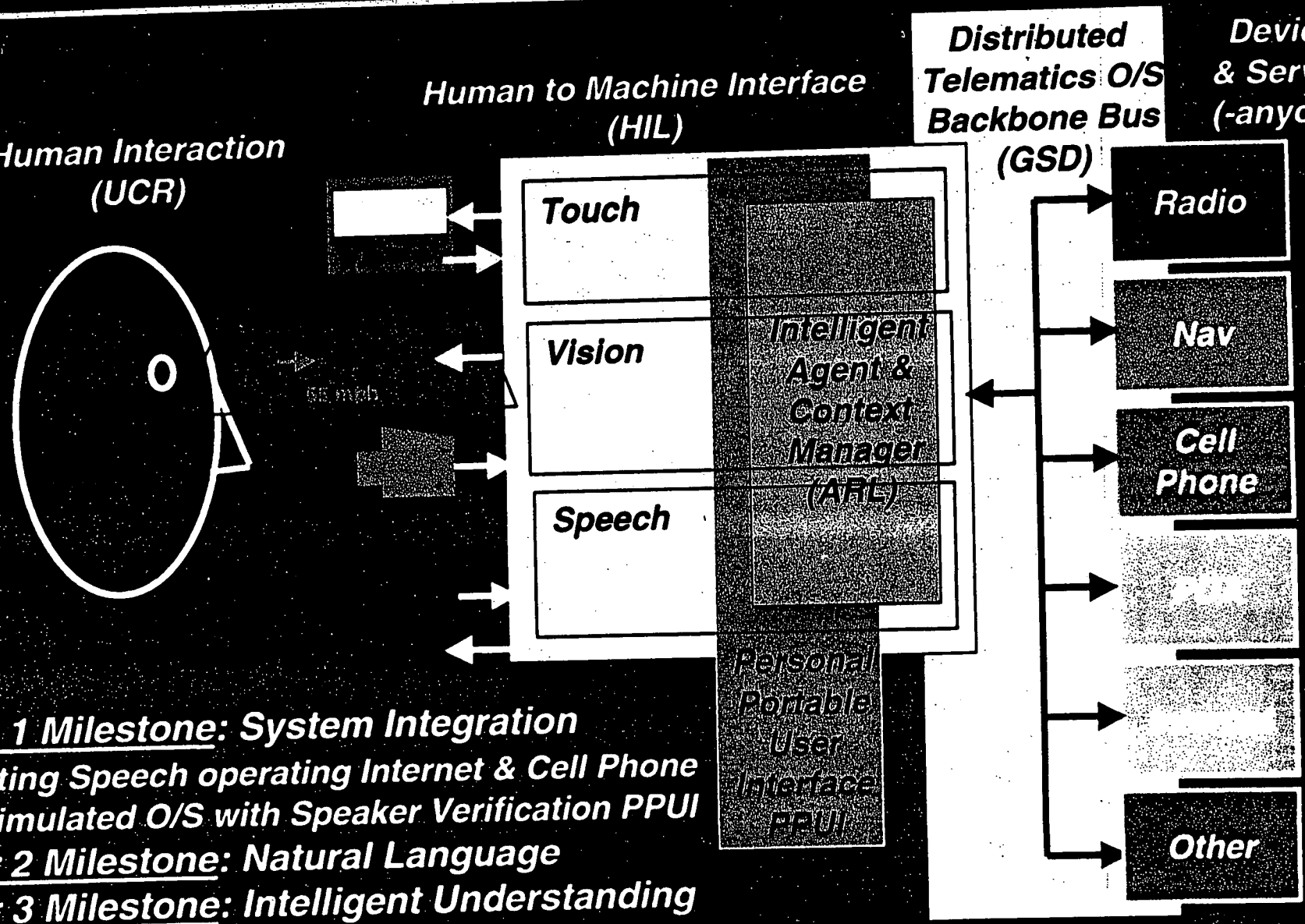
Motorola Labs
creating the future

Intelligent Agents/Situational Awareness

		1999	2000	2001	2002	2003
Intelligent Agents	Tasks	lookup info	Handle messages	Process queries		Goal/Plan
	Actions	Make suggestions		Customize preferences		Initiate Queries/Actions
Situational Awareness	Displays	Text/buttons		HUD/Audio		Total SA Display
	User		Personality profile		Emotional state	Intentions
	System	Internal subsystems		Dynamic systems		Auto-maintain
	External		Services/roads		Traffic/current state	Personal Goals
		SpeakIt - 0			SpeakIt - 1	
			"James" - 0		"James" - 1	
	Ext. Comm.					
	Network Connectivity	Local Data		Web Access		Value Added servers

Project Description: System Overview

MOTOROLA LABS



Year 1 Milestone: System Integration

Existing Speech operating Internet & Cell Phone on simulated O/S with Speaker Verification PPUI

Year 2 Milestone: Natural Language

Year 3 Milestone: Intelligent Understanding

Mission, Vision, Objectives

Intelligent agents

Intelligent Agents are software entities that assist people and act on their behalf. They make your life easier, save you time, and simplify your complex world.

- **Strategic Intent**
  - Our interface will have an agent in the background that will constantly analyze the current situation and constantly improve the usefulness, effectiveness and friendliness of operation. This will cause people to prefer our system over all others.

- **Value Proposition**
  - Our agent function will decrease the cognitive load of the user over currently fielded systems.
  - Our interface will be so pleasant that users will pay a cost premium over competing systems.
  - More effective in its function by having the agent perform many of tasks formally done by the user

Environmental Scan

- **Key Trends**
  - Economic - information is becoming more valuable than hardware/software, and saving time is more important than money/cost.
  - Legislative - automotive user cognitive load (especially with cell phones) is becoming a major concern now being addressed with new laws.
  - Customer - consumers want more access anytime, anywhere; need better/easier interface. Automotive industry want 'driver advocate' for more safety.
  - Technology - advanced user interface technologies (e.g. speech recognition) are becoming mainstream; increasing functionality of devices leads to more complex interfaces.
- **Customers**
  - Mot business groups serving automotive manufacturers
  - Final consumer, i.e. drivers vs. passengers
- **Competition**
  - IBM, ATT, university research, Microsoft
- **Technology**
  - Initially use fixed, 'canned' knowledge/patterns, for observations.
  - Grow into information discovery and goal seeking action taking agents.

Single Mission Challenge

Motorola AIEG

Starting Thoughts

- Driver as the center: Personal Vehicular System vision
- Not "safe as before," but "safer than before"
- Software Definable Features

Challenge All Assumptions

- Local battery powered systems (recharge via thin wire)
- Self powered systems
- RF connected systems
- What does the driver need?
- Driver model guides services
- Forget existing partitions
- Central vs. Distributed control

Scope

- Vehicle Interior, in particular:
  - Driver Interface
  - Network
  - Sensors, Actuators
  - RF Platform

Process

- Define Feature Classes
  - Example: Vehicle Exterior Environment Sensing (rear parking aid, smart cruise control, lane change aid, etc.)
- Define Vehicle Platforms to Support Feature Classes
  - Example: VEES requires: sensor mounting locations on all sides and undercarriage, access to driver interface, signal and power wiring etc.
- Define Product Roadmap
  - First generation VEES: low-speed rear parking aid
  - Second generation: add smart cruise control
  - etc.

Feature Classes for Discussion

- Driver Model
  - Orchestrates information flow to driver, manages driver workload
  - Estimates driver capability, coaching or warnings as required
  - Usability and Acceptability judged by non-technical experts (cognitive psychologist, cultural anthropologist)
  - Increases driver capability, thus safety

Feature Classes continued

- Interior Lighting
  - Context sensitive, illuminate areas where attention is required, illuminate areas when used
  - Expand glove-box light concept to other functional areas

Feature Classes continued

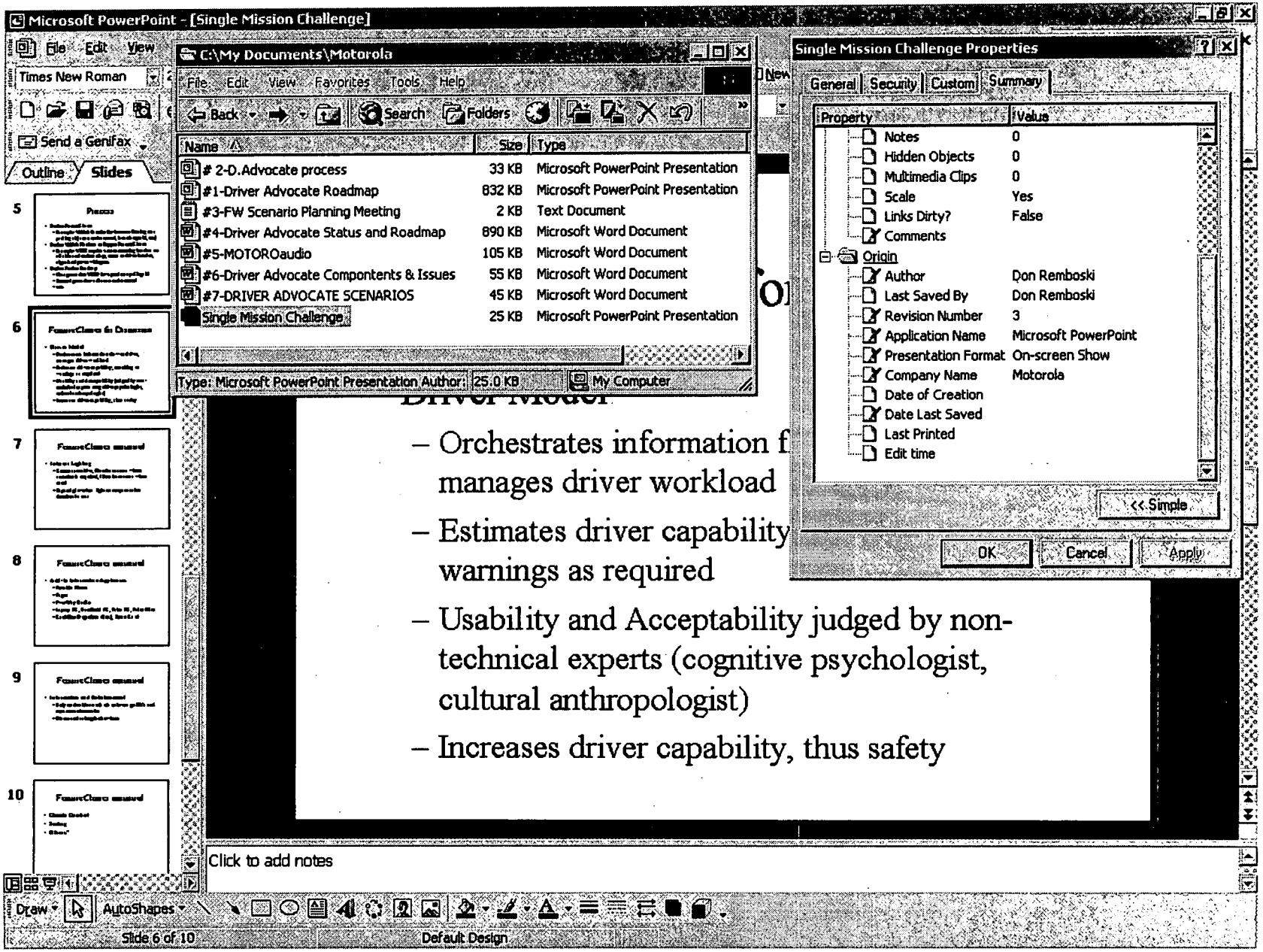
- Add-In Information Appliances
  - Portable Phone
  - Pager
  - Two-Way Radio
  - Laptop PC, Handheld PC, Palm PC, Palm Pilot
  - Card-Size Organizer (Rex), Smart Card

Feature Classes continued

- Information and Entertainment
  - Rely on durable standards to leverage ISVs and consumer electronics
  - Discussed at length elsewhere

Feature Classes continued

- Climate Control
- Seating
- Others?


Microsoft PowerPoint - [Single Mission Challenge]
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Single Mission Challenge Properties
– Orchestrates information f
manages driver workload
– Estimates driver capability
warnings as required
– Usability and Acceptability judged by non-technical experts (cognitive psychologist, cultural anthropologist)
– Increases driver capability, thus safety
Click to add notes
Slide 6 of 10
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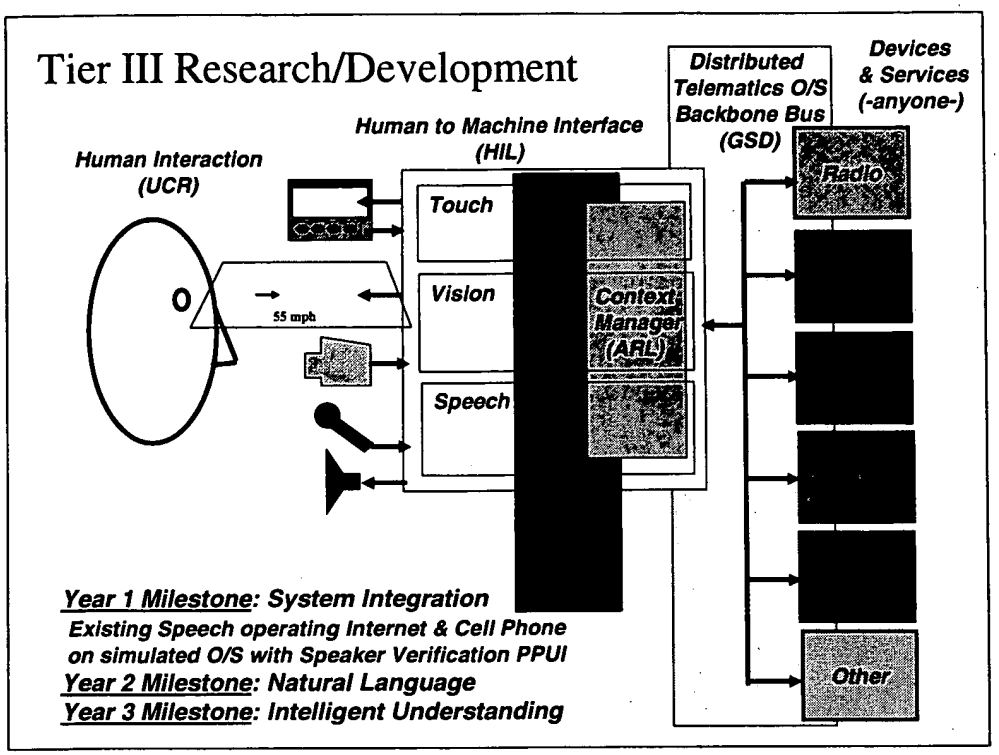


Four Fundamental Areas of Engineering for Telematics Car of Future

1) Human Interaction - Cognitive Science study required
2) Unified Human-to-Machine Interface - multi-modal serving all component devices and services while meeting the Human Interaction specifications especially minimizing cognitive load of driver.
3) Telematics O/S - distributed system allowing mix and match of components using common interface
4) Component Devices and Services - various fixed and portable components and access to services allowed because of common system interface and unified human interface approach.

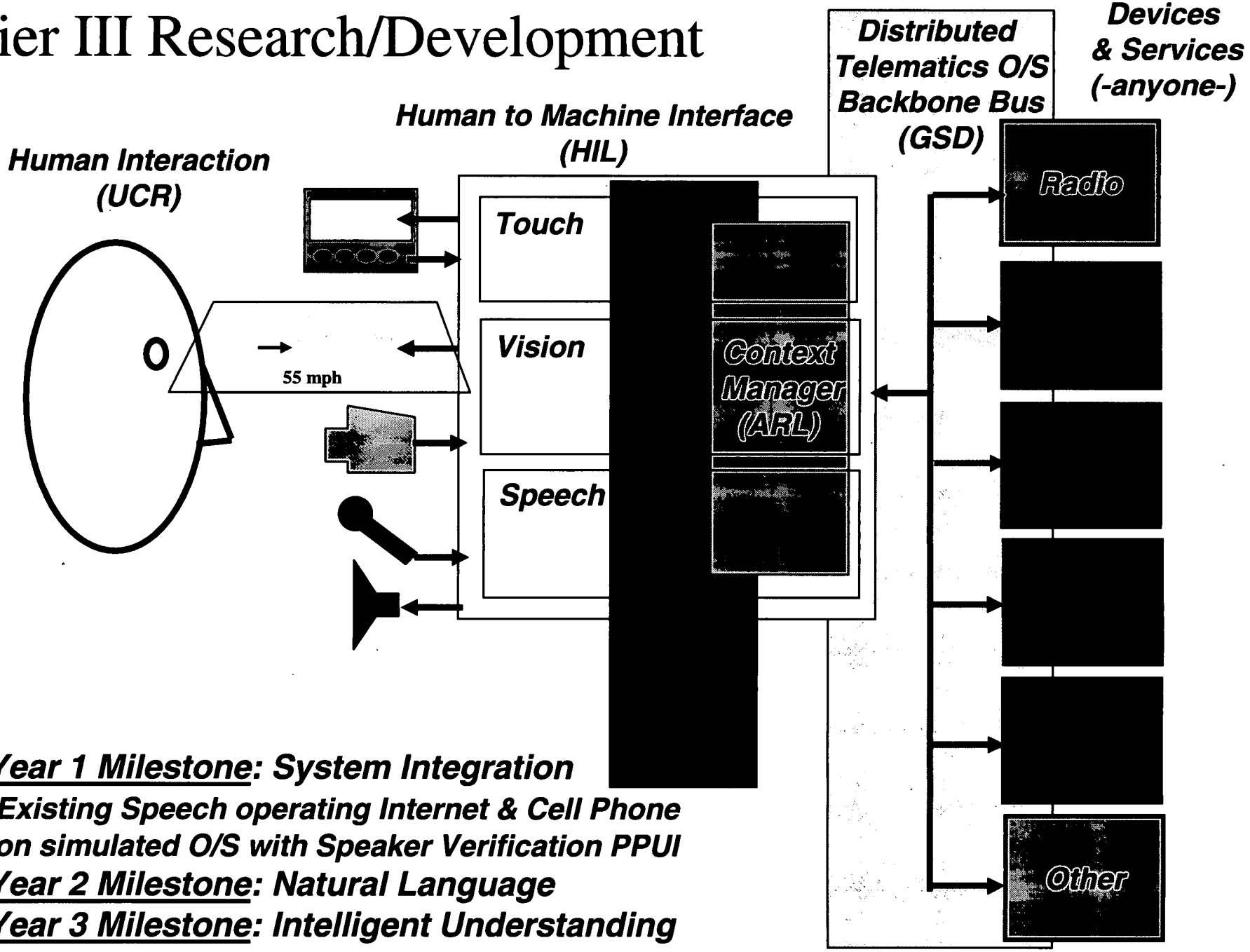
Who does what:

HIL's charter covers the Human-to machine Interface. :
Human Interaction - covered by Redacted (David Wheatley)
Telematics OS - covered by
Devices & Services -can be created by many others

Technology Research by HIL:

1st Year Milestone Demo:
1) Outfit an automobile for a long term series of research and product-integration prototype demos. (HIL)
2) Finish Telematics O/S system and Device/Service simulator
3) Install existing Speech Recognition and Text-to-Speech accessing Cell Phone and Web sight simulation (or actual hardware)
4) Install Car Security Speaker Verification portion of Personal,Portable User Interface (HIL)

Tier III Research/Development



***Year 1 Milestone*: System Integration**

Existing Speech operating Internet & Cell Phone on simulated O/S with Speaker Verification PPUI

***Year 2 Milestone*: Natural Language**

***Year 3 Milestone*: Intelligent Understanding**

Microsoft PowerPoint - [HIL TCG RMTR Contribution]

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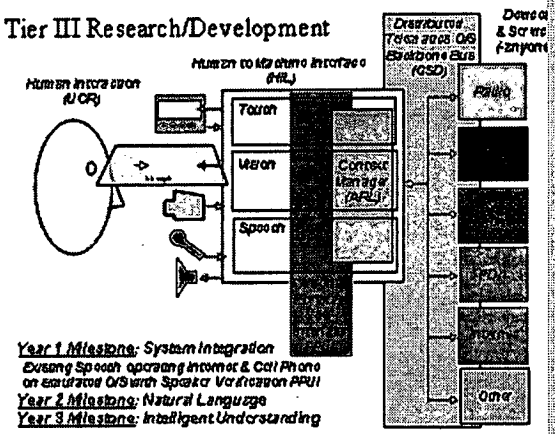
Tier III Research/Development



Year 1 Milestone: System Integration
Existing Speech operating Internet & Cell Phone on Embedded O/S with Speaker Verification API's
Year 2 Milestone: Natural Language
Year 3 Milestone: Intelligent Understanding

Four Fundamental Areas of Engineering for Telematics Car of Future

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Telematics OS - covered by Mot. Australia Software Center of Global Software Div.
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HIL TCG RMTR Contribution Properties

General | Summary | Statistics | Contents | Custom

Created:
Modified:
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Last saved by: Wood
Revision number: 8
Total editing time: 364 Minutes

Statistics:

Statistic name	Value
Slides:	6
Paragraphs:	255
Words:	1047
Bytes:	93838
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Multimedia clips:	0
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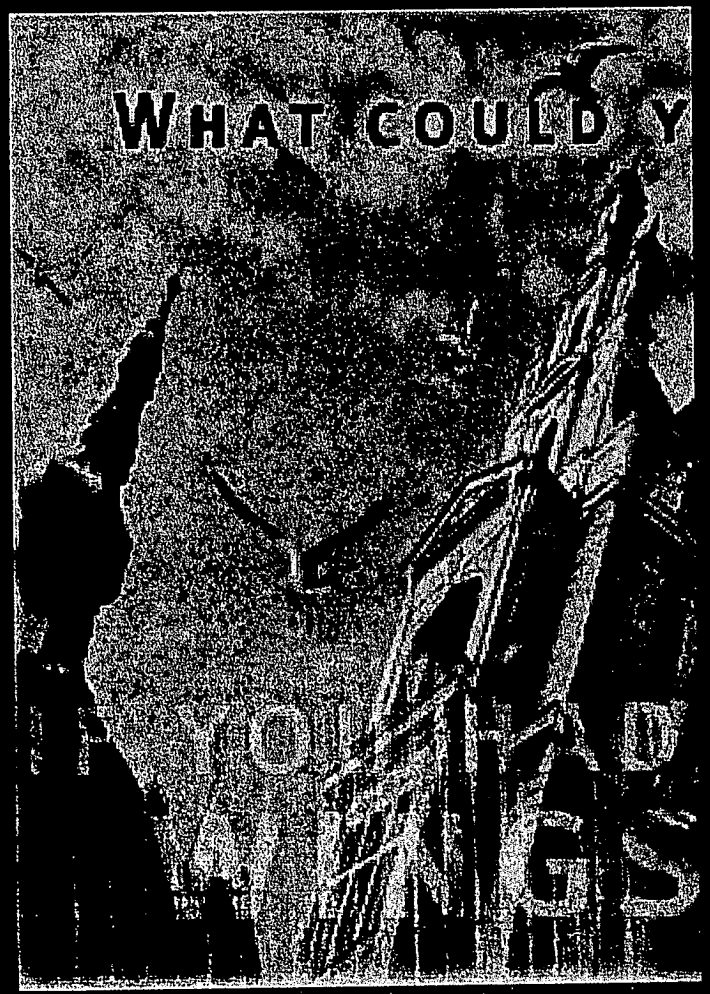
Notes 5 of 6 Blank Presentation

Human Interface Laboratory

WINGS



Access to the World in a Human Friendly Way

Human Interface Laboratory

Human Interface Lab

- HIL - Schaumburg, IL
- HIL - Naperville, IL
- HIL - Phoenix, AZ
- HIL - Palo Alto, CA
- HIL - Boynton Beach, FL
- HIL - Sidney
- HIL - Basingstoke

Human Interface Laboratory

Purpose:

Lead Motorola in bringing new user interface technologies to reality.

Methods:

- Drive breakaway user interface technologies through internal research and external partnering.
- Transfer technology & knowledge to product organizations.
- Use an understanding of Human Experience to guide research and evaluation of U.I. technologies.

A Car Which Understands and Responds to Natural Language

Enabling Technologies:

- *Noise Robustness*
- *Natural Language Understanding*
- *Natural Text-to-Speech*
- *System Adaptation to User*
- *Portable, Personal User Interface*

Collaborating with Research and Business units internationally.

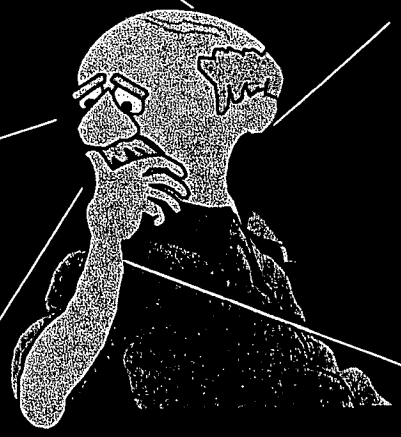
Human Interface Laboratory

Physiology

Information Processing

Content Translation

- **Cognitive Interfaces**
- BrainWave Recognition



- **Auditory Interfaces**
- Speech Recognition
- Language Understanding
- Speech generation
- Speech Coding

- **Visual Interfaces**
- Display Technologies
- Sight Enhancement
- Motion Detection

- **Haptic Interfaces**
- Gesture Recognition
- Handwriting Recognition
- Keypads

- **Taste/Olfactory Interface**
- Odor Identification / Generation
- Taste Recognition

Social

Culture

Human Interface Laboratory

Issues

Technology Transfer

- The "maturity" of the product we deliver
- Process

Scope of Research Projects

- Balance near term need with long term research
- Focus areas & resource allocation

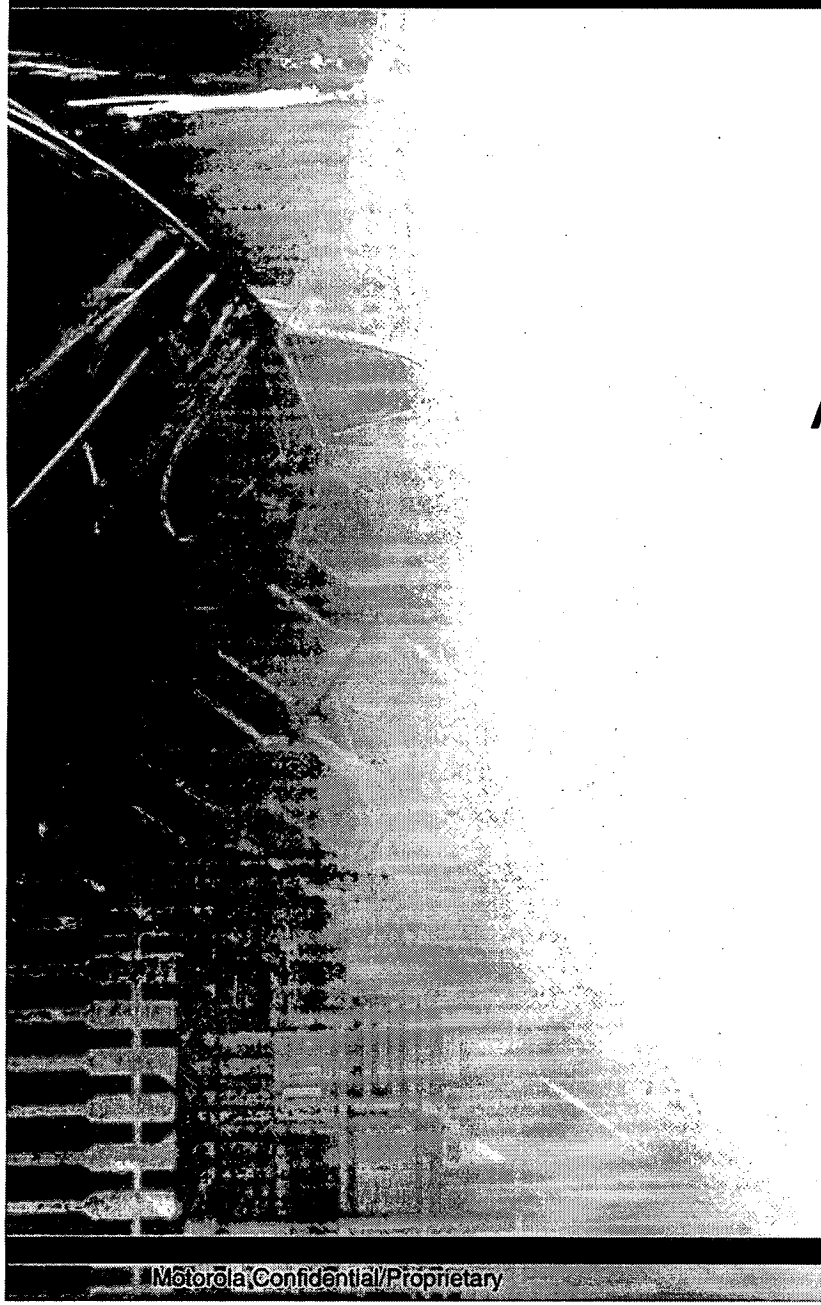
Unification of HIL activities company-wide

- Leverage the distributed nature of lab

Obtaining new talent in the appropriate areas

- Critical mass in required U.I. technology areas
- Critical mass for Human Experience research

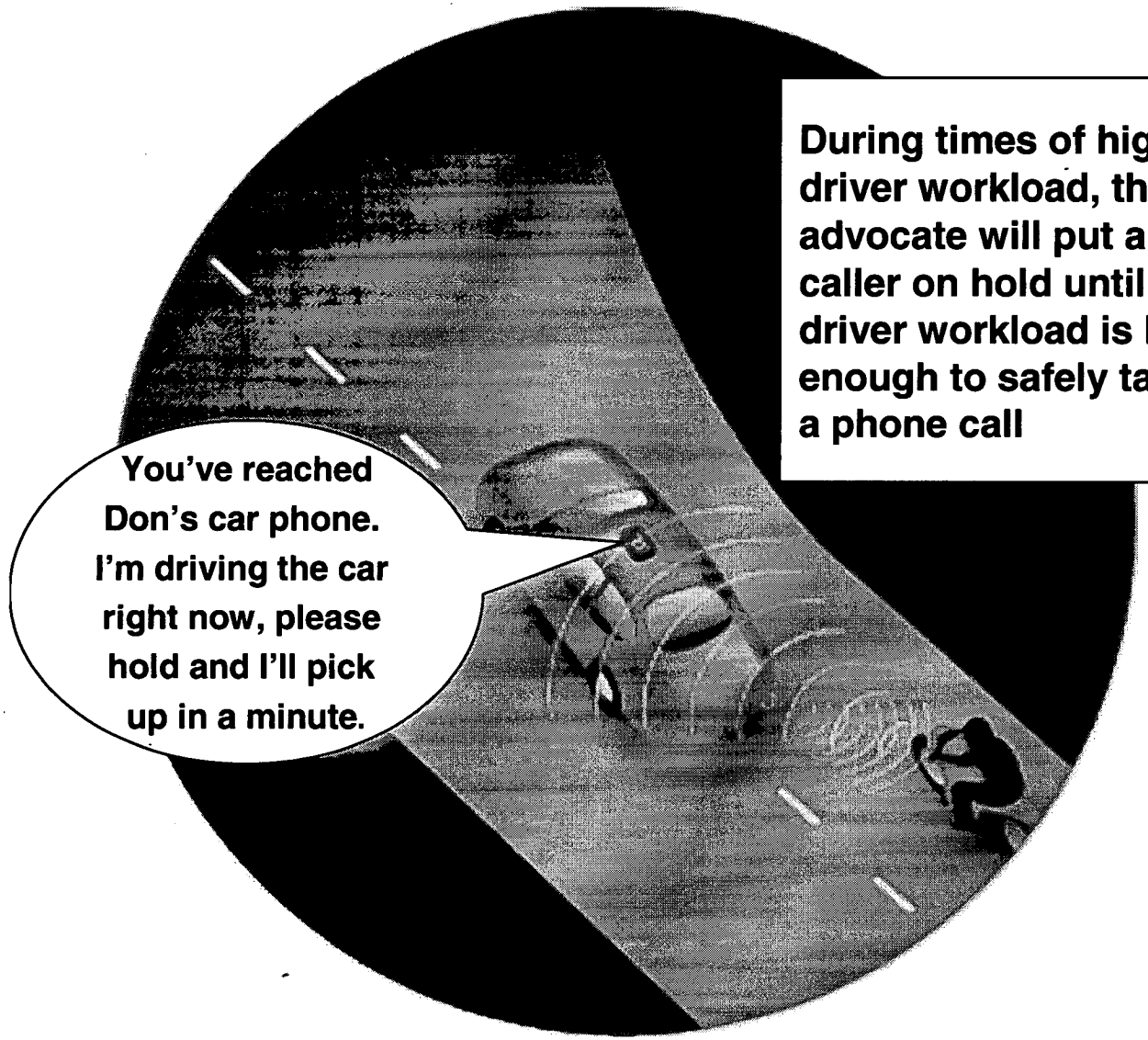
MOTOROLA



Autobody, Chassis and Sensors Division

AIEG-IESS

Driver Advocate



During times of high driver workload, the advocate will put a caller on hold until the driver workload is low enough to safely take a phone call

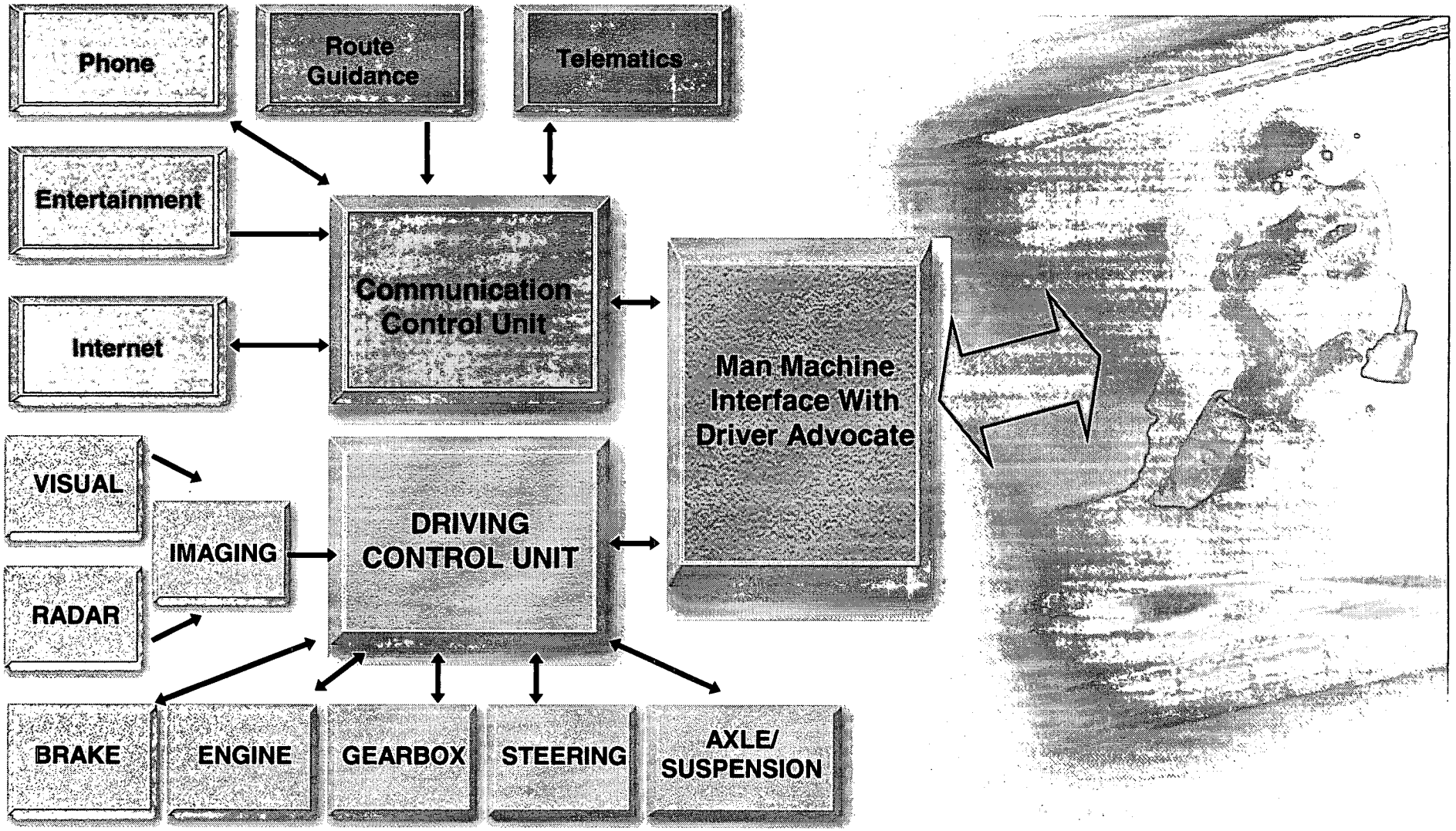
Driver Advocate

Tactical Information

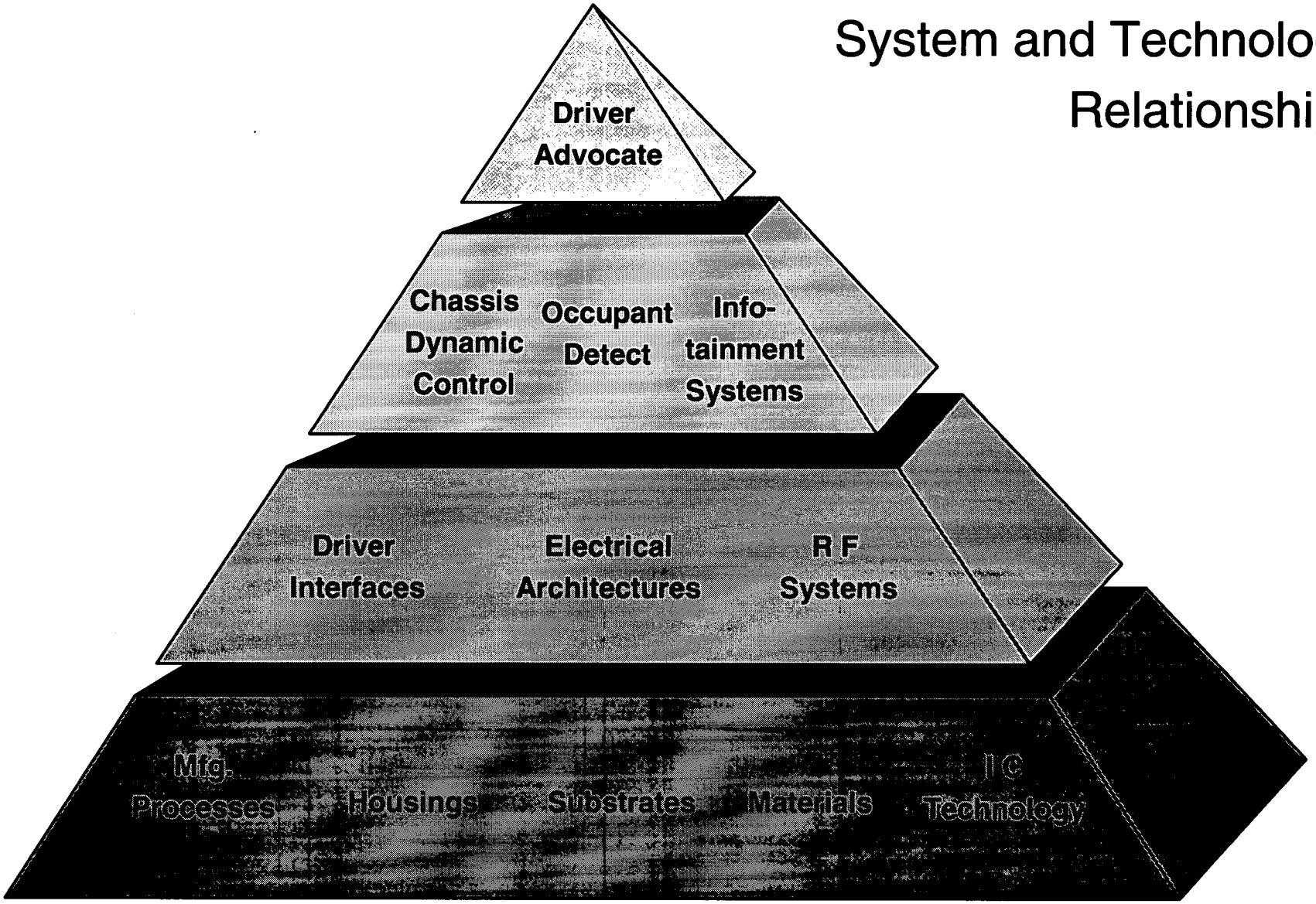
- Collision Warnings
- Lane Departures
- Adjacent Vehicle Too Close

Workload Management

- Reduce peak workload by controlling the driver's access to non-driving related systems
- Orchestrate the driver's attention to the most important tasks by using multifunction displays, audible and tactile feedback.



System and Technology Relationships



Driver Advocate

Generation 1 "One at a Time"

- –Current package of sensors and actuators
- –To the extent possible causes only one thing to happen at a time
- –Inputs: steering, brake, throttle, switch closures, navigation, phone, infotainment

Driver Advocate

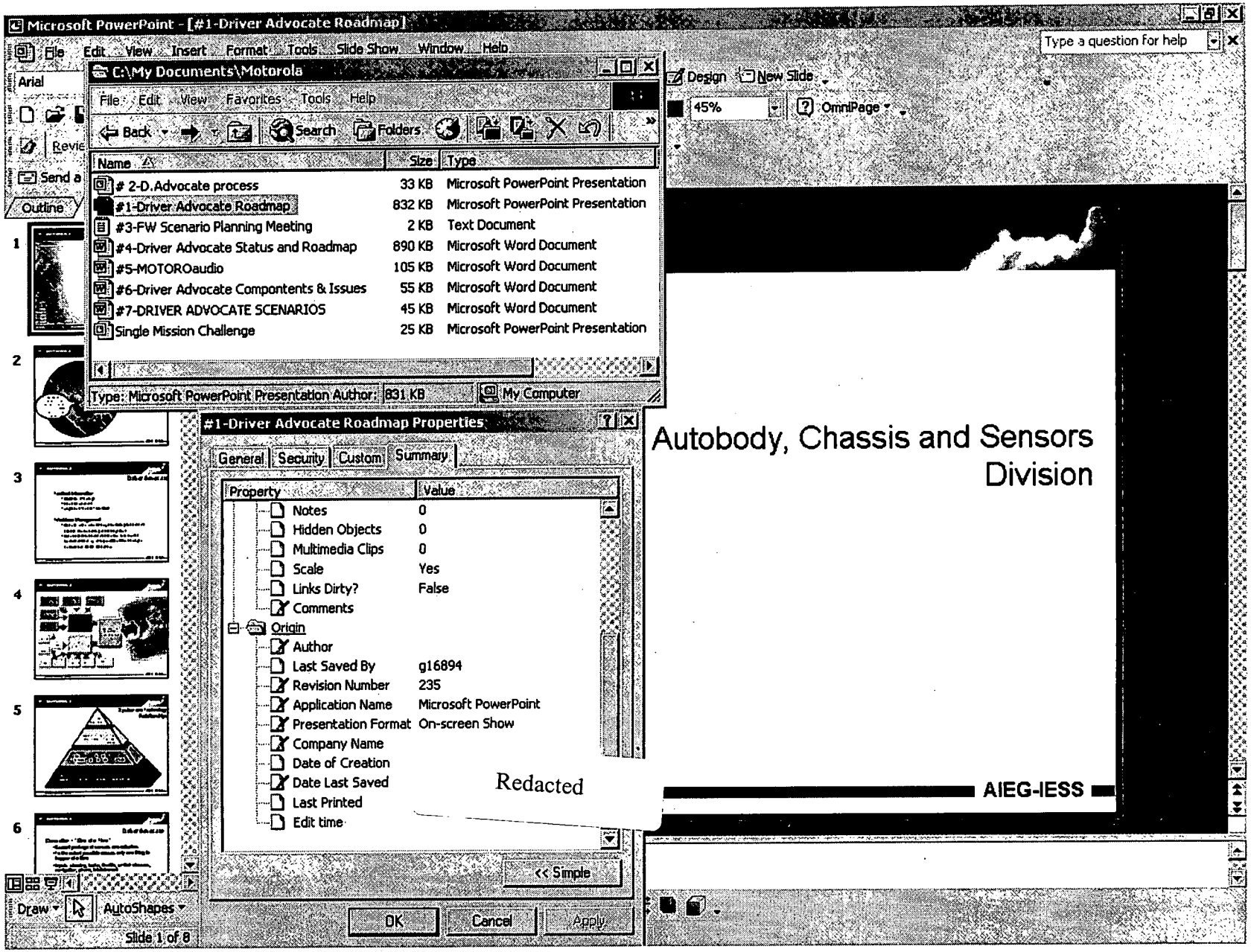
Generation 2 "Vehicle Aware, Driver Aware"

- –First generation external monitoring (parking aid, lane following)
- –First generation affective input (simple drowsy driver determination)
- –Orchestrates driver's attention to the most important task at hand

Driver Advocate

Generation 3 "First AGV Interface"

- –Handles combination of autonomous driving and human controlled driving
- –Complete external monitoring (collision warning, road surface)
- –Sophisticated affective input (vocal stress, facial expression, etc.)
- –ITS infrastructure (vehicle-to-vehicle status, vehicle to infrastructure status)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File Edit View Favorites Tools Help
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Name Size Type
2-D.Advocate process 33 KB Microsoft PowerPoint Presentation
#1-Driver Advocate Roadmap 832 KB Microsoft PowerPoint Presentation
#3-FW Scenario Planning Meeting 2 KB Text Document
#4-Driver Advocate Status and Roadmap 890 KB Microsoft Word Document
#5-MOTOROaudio 105 KB Microsoft Word Document
#6-Driver Advocate Compontents & Issues 55 KB Microsoft Word Document
#7-DRIVER ADVOCATE SCENARIOS 45 KB Microsoft Word Document
Single Mission Challenge 25 KB Microsoft PowerPoint Presentation
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#1-Driver Advocate Roadmap Properties
General Security Custom Summary
Property Value
Notes 0
Hidden Objects 0
Multimedia Clips 0
Scale Yes
Links Dirty? False
Comments
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Author
Last Saved By g16894
Revision Number 235
Application Name Microsoft PowerPoint
Presentation Format On-screen Show
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Autobody, Chassis and Sensors Division
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Draw AutoShapes
Slide 1 of 8

From: Remboski Don-G10491
Sent: Redacted
To: Cops Michael-GUSR220; Peseski William-G13805; O'Connor Con-G11115; Channon Stephen-G15266; Bezek Craig-G14456
Subject: Driver Advocate Status and Roadmap

Project Goal:
Produce a system to manage peak driver workload and provide tactical information to the driver in a manner that is consistent with customer expectations and highway safety.

Project Status:
Two groups at Motorola Labs are reviewing the human factors literature. A storyboarding process is underway to understand the scenarios under which the driver advocate operates. Combining the literature search and storyboarding will identify white spaces and set the primary research direction. The goal of this first research is to guide a mid-year demonstration of the driver advocate.

Please see the attached presentation for a high-level overview of the driver advocate and a roadmap showing the first three generations of product.

-djr

Driver Advocate Roadmap.ppt (8...

Preliminary Draft--Driver Advocate Components & Issues

Goals for the Driver Advocate

- Reduce Highway Incidents
  - Thereby reducing associated monetary costs
    - For victims and their families
    - For the medical and emergency response systems
    - Due to resulting traffic congestion and delays
- Maintain Driver's arousal curve in the "sweet spot"
- Reduce fuel consumption
- Reduce emissions
- Develop a public awareness of Motorola' and the OEM's commitment to safety in the integration of information systems into automobiles. Overcome the skepticism (or worse, cynicism) that has resulted from the in-vehicle use of cell phones.)

Blue Sky List of Possible Components/Functions to be Integrated into the DA

- **Vehicle/driver status monitoring and warning devices**
  - Tire pressure
  - Approximate number of miles-worth of gas remaining at present speed
  - Battery strength
  - Diagnostic report when car is started/turned off (can be enabled/disabled)
    - Emissions
    - Braking system
    - Fluid levels
    - Burned out bulbs
    - Condition and amount of radiator fluid and engine oil
  - Remote diagnostic services
  - After-theft location assistance based on global satellite positioning technology
  - Driver alertness monitoring and warning

- **Vehicle Warning Devices**
  - Steering
    - Trajectory prediction (DAI-3)
    - Lane detection (DAI-3)
  - Collision Avoidance
    - Collision Warning
      - Along the longitudinal axis of the vehicle
        - (It's been observed in UK and US that as traffic congestion increases headway is shortened.) (DAI-4)
      - Forward facing radar and video image processing for obstacles and stopped vehicles (DAI-3)
    - Emergency Intervention (See Control Issue 1 below.)
  - Context monitoring devices for determining proximity, speed and position of other vehicles, road hazards, etc.

  - Signal Mode

- Audible
  - Personalized
  - Non-personalized
    - Hierarchy of urgency
- Visual
  - HUD readout, verbal, iconic, or enhanced visual
- Haptic
  - "Augmented" reality: virtual rumble strips, seat movement, what else?
  - Resistance on foot pedal or steering wheel

- **Vehicle Control Devices**
  - Crash avoidance (Will crash avoidance and stability systems be included in the Driver Advocate? If so, in which generation? Don, you have repeatedly expressed your skepticism about crash avoidance technologies. Why? Do you, personally, want them included in D.A.?)
  - Lane departure (Are there any points at which we want the vehicle to take control of the driving process based on lane departure information—e. g. if it is leaving the roadway? Or to we simply want a strong warning, or two, which will alert the driver to the need for immediate action?)
  - Gas pedals that push back when speed limit is being exceeded (How does the vehicle determine that short of radio transmissions from the roadside?)
  - Steering wheels that resist turning when turning is dangerous—such as when an on-board detection system senses an approaching vehicle in the target lane[1]
  - Driver conditioning monitoring that can disable the vehicle under certain conditions, such as intoxication or drowsiness.
  - Disabling of the vehicle when it is determined that it has been stolen

- **Electronic Communication and Information Systems Components**
  - Telephony
    - Full-duplex driver-initiated cell phone calls (is there any reason to allow the driver to make full-duplex calls but not to receive them?)
    - Half-duplex cell phone calls
    - Automated e-calls such as On-Star
  - Web-based Information
    - What, if anything, can the driver reasonably access in a moving vehicle?[2] [Don, I need to hear from you about this one. It doesn't seem very feasible to me at this point.]
    - How to allow passengers access while limiting driver access
  - Entertainment
    - Programmable radio, CD's, tapes
      - Songs that the driver personalizes that s/he loves to sing—to maintain attention/alertness
    - The capacity to tape what one is listening to on the radio
      - What happened to that radio frequency that allowed one to listen to the audio of a television show?)
    - Games for the driver and passenger to play to while away the time

---

[1] See Control Issue 1.
[2] See Control Issue 1.

- Traveler services (with multi-lingual options?)
  - Smart-card
    - Set driver preferences for seats, mirrors, electronic devices
    - Automatic payment of tolls, parking, park admissions, etc.
  - Navigation and Guidance Systems
    - Navigation assistance based on Global Satellite Positioning technology or dead reckoning or a combination of the two
    - Visual and/or auditory guidance advice to the driver
    - Variable Message Systems (VMS) that would provide information on:
      - Road conditions
      - Traffic conditions
      - Weather conditions
      - Parking availability (I have seen this mentioned, repeatedly, but have not read what technology must be in place in order to make it feasible)
      - Park and Ride information (such as upcoming departure times)
      - Timetable and prices for public transportation services such as ferries, trains, buses, etc., including information on "next available"
      - Real time incident reports
  - Office-on-the-Road
    - Cell phone access
    - E-mail access
    - Web browser (Will there be "unlimited access" or access restricted to information needed for weather, road conditions, etc.? Or when the car is in park? Voice activated only? Are there now voice-activated browsers?)[3]
    - Memos to oneself or ones co-workers
    - Access to one's scheduler
    - Personal address and phone book
    - Public telephone information service, including yellow pages
    - A means to easily record trip mileage and purpose
  - Shopping information
    - Virtual yellow pages
    - Hotel and restaurant information
    - Service station and auto repair facilities locator
  - Emergency Information
    - Hospital and medical center information
    - Police and Fire service locations (and a way to test the connection without flooding the systems)

- **Some General Questions**
  - What goes in which generation of the Driver Advocate?
  - Are you thinking of selling advertising on the Driver Advocate? Or prohibiting that from happening? Or what?
  - I wish there were a way to provide vehicle to vehicle communication in such a way that we would not increase the potential for "road rage".

[3] Lots of potential for public backlash here. I hear a sneer in the voices of many people when they talk about bringing the Net to the automobile.

- What could we do to Integrate specific services to benefit inexperienced and/or disabled drivers.
- Do we want e-mail in the first generation? How about short-message e-mail? Do we know when that might be feasible?
- What if we allowed it to read/receive e-mail and voice mail and to respond in situation-specific ways in the driver's voice?
    - Hi, this is Don. I'm in heavy traffic at the moment. As soon as things calm down your message will be put through to me. (I'll respond as soon as I am able.)
    - Hi, this is Don. My in-car computer is being used for another purpose at the moment. As soon as it is available to respond to your message I will do so.
    - Hi, this is Don. Right now I am neither in my office nor in my vehicle to receive your message. If it is urgent, you could try my cell phone at 313 304-5222. Otherwise, I'll respond as soon as I return.

Questions about Technical Feasibility

- How to provide for half duplex conversation of considerable duration (one half hour potential, at least) such that it begins "sending" and/or "receiving" within a minute or two of the time the call is initiated. (So that the call is virtually real time.) Some sort of "tape delay."
- Is there a way to make good driving performance measurable and reportable to the driver of the automobile (similar to Don's "game") without simultaneously creating a record that could be problematic in a court of law? Or do we mind that latter part?
- How can we build "context sensitivity" into the Driver Advocate in a way that focuses the driver's attention on the most important driving tasks when necessary, and releases a part of her attention to focus elsewhere when, in context, that might actually improve his/her driving performance? (One of the Phoenix questions?)
- Is there a way to provide the driver with "observations and suggestions" in the way of coaching that is acceptable/not irritating?

Control Issues

1. Is there any point at which we want the vehicle to take control of the driving process? If so, some research has shown that it is the transition to and from driver control that is most dangerous/critical/difficult
    a. Adaptive cruise control
    b. Speed monitoring devices
    c. When it has been determined, through sensors?, that the vehicle has been stolen

2. Don't present the driver with any choices to be made while driving about how to prioritize incoming information

3. Set up an access tree for the incoming (and outgoing) information such that decision priorities are determined on the basis of relative safety and security issues. [Should that tree be non-linear or linear or both?]

Looking at the Competition

MS Apollo

Capabilities:

- Voice recognition and voice response
- E-mail receive and send capabilities. It identifies who the e-mail is from before you decide whether to listen to it or not
- Navigation system with
  - Integration of traffic information
  - The capability to alter navigation instructions to
  -
  - Restaurant locations (and other things?)

[Note this look at Apollo is preliminary. I haven't been very systematic about it yet.]

Questions respecting the Driver Advocate

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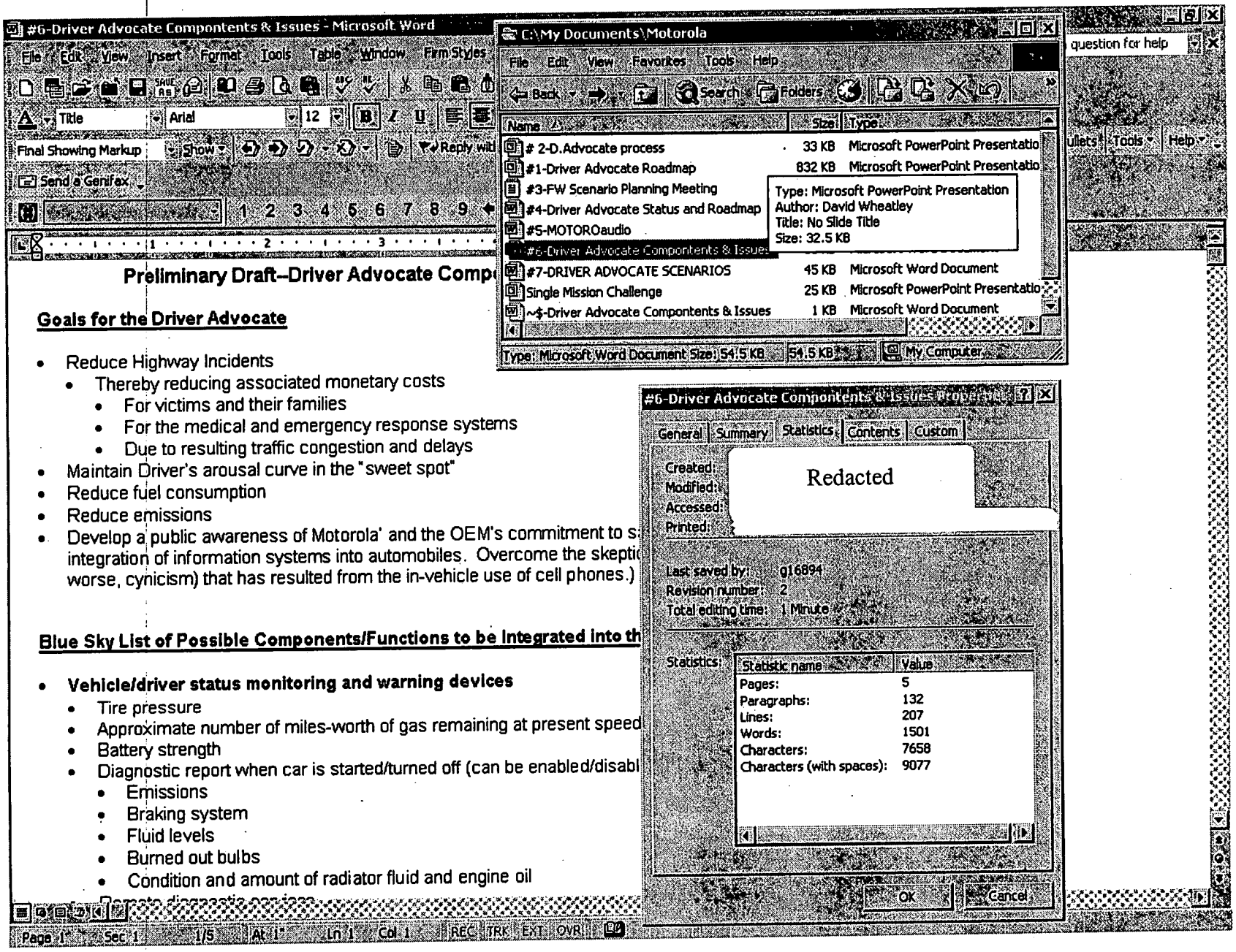
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#7-DRIVER ADVOCATE SCENARIOS 45 KB Microsoft Word Document
Single Mission Challenge 25 KB Microsoft PowerPoint Presentatio
~$-Driver Advocate Compontents & Issues 1 KB Microsoft Word Document
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Author: David Wheatley
Title: No Slide Title
Size: 32.5 KB
Redacted
Statistic name Value
Pages: 5
Paragraphs: 132
Lines: 207
Words: 1501
Characters: 7658
Characters (with spaces): 9077

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DRIVER ADVOCATE SCENARIOS

General principles

These are the general human factors principles which will be applied in all aspects of the driver advocate system operation;

1] Vehicle control is never removed from the driver.
2] Drowsy driver presented with options, choices.
3] Drivers attention directed to highest priority – heirarchy of importance is ;
Driving operation – correcting poor traffic situation
Driver State – correcting poor driver state
Correcting poor vehicle state
Maintenance
4] Alerts and alarms represent directionality (where appropriate)
5] Visual display presented only when hazard potential exists
6] Initial alert is visual and/or haptic only, not auditory – does not alert or alarm passengers
7] High level alarm is visual and/or haptic and auditory to inform all vehicle occupants

Scenario 1a – Forward Collision Warning – on screen

Demonstrates – forward collision warning via HUD, escalation of alert, number of escalation levels, eyes off road, verbal stop alarm, vehicle to vehicle data communication, driver training in system operation & safe following distance.
[Driver Advocate – Phase II]

Person driving along a freeway at 55 mph, listening to the radio with cruise control on. Starts to close on a vehicle in front which is slowing down. *(System identifies speed differential and rate of reduction of headway).*

Driver has visual indication consisting of horizontal amber line (HUD) projected onto windscreen with two converging lines linking to vehicle front – these give impression of distance using perspective. *(Image presented only when there is a vehicle within range, even if not visible to driver– benefits in poor visibility).* Position of line indicator gives safe following distance – if vehicle above line, gap is OK if vehicle below line, gap is too close. *(stopping distance based upon; road conditions, [rain sensor] relative speed of vehicles, drivers age and previous behaviour patterns.*

Line position moves slightly as vehicles close together, beyond "risk point", colour changes to red and indicates (privately to driver, with no audible alarm) that gap is too small – this is alert level. *(If internal video camera additionally determines that driver is not looking at the road – then it also adds an auditory alert – normally this would not be done).*

[Note – internal camera also used to determine driver eye position and adjust HUD image accordingly to maintain accuracy].

[System gives no visual display below 10mph to avoid annoyance a traffic lights or in very slow moving traffic – may however, have auditory alert if vehicles get VERY close at low speeds]

Vehicles continue to close and driver starts to react as the high alarm level (almost unavoidable forward collision) occurs from direction of front of car. Visual indication stays red and flashes, radio muted, cruise control cut out *[mild braking may also be applied]* and verbal command given to "stop". *[male, female voice according to preference]*. Data passed onto following vehicle *(if within predefined distance and speed differential parameters)* and a TBD alert indication presented to the following driver. Hazard lights also activated with the alarm to alert other nearby drivers without an advocate system that there is a potential accident.

He finally does an emergency stop, swerving slightly to avoid the now stationary vehicle, driver looks in rear view mirror to see following vehicle comfortably slowing down due to the advanced warning provided by the vehicle to vehicle datalink.

Scenario 1b – Forward Collision Warning – on dash

Demonstrates – forward collision warning via LED array, escalation of alert, number of escalation levels, driver not having eyes on road, verbal slow down alarm, vehicle to vehicle data communication.

Person driving along a freeway at 55 mph, listening to the radio with cruise control on. Starts to close on a vehicle in front which is slowing down. *(System identifies speed differential and rate of reduction of headway).*

Driver has no indication on HUD but has vertical array of LED's (eg 4) on top of dashboard immediately in front of him. These are off when no vehicle in front, green when safe distance from vehicle in front, turning to red as distance decreases, indicating (privately to driver, with no audible alarm) that distance is closing. Physical format of warning lights infers frontal perspective view. *(If internal video camera additionally determines that driver is not looking at the road – then it also adds an auditory alert – normally this would not be done). Safe following distance (stopping distance) based upon; road conditions,[rain sensor] relative speed of vehicles, drivers age and previous behaviour patterns (?)..*

[System gives no visual display below 10mph to avoid annoyance a traffic lights or in very slow moving traffic – may however, have auditory alert if vehicles get VERY close at low speeds]

Vehicles continue to close and driver starts to react as the high alarm level (almost unavoidable forward collision) occurs from direction of front of car. All LED's become red and flash, loud auditory alarm presented, radio muted and cruise control cut out.

Data passed onto following vehicle *(if within predefined distance and speed differential parameters)* and a TBD alert indication presented to the following driver. Hazard lights also activated with the alarm to alert other nearby drivers without an advocate system that there is a potential for accident.

He finally does an emergency stop, swerving slightly to avoid the now stationary vehicle, driver looks in rear view mirror to see following vehicle comfortably slowing down due to the advanced warning provided by the vehicle to vehicle datalink.

Scenario 2 – Cellphone Use leading to Lane Departure

Demonstrates – lane departure warning via HUD, temporal repeat of alert, use of haptic display, automatic suspension of phone call,

Person driving a car along a multi-lane highway. Driver Advocate responds to incoming telephone call by presenting message to caller *" Don is currently driving and will take your call in a moment"* it then indicates incoming phone call to driver who chooses to take call becoming deeply involved in the handsfree voice conversation. Car begins to stray into the adjacent traffic lane. *[System identifies poor lanekeeping – reducing distance to line marker with no activation of turn signal].*

First alert to driver is a dotted red line highlighting lane edge on HUD along with "bump, bump" alert via audio system and corresponding haptic "bump" through steering wheel and through seat massage system (if fitted). *[Audio reflects direction of potential lane departure]* Phone call not interrupted at this stage and caller can also hear auditory warnings.

Driver corrects course but continues conversation and a few moments later starts to deviate again across lane edge. Same information alerts are repeated. *[Does not go to higher level of alert since degree of hazard is unchanged]* Driver does not correct course and car continues and crosses lane marker.

Driver now gets high alarm– dotted line flashes red, telephone call remains ongoing but auditory "bump, bump" alarm continues at a volume which makes continuing the call difficult. The haptic display also causes coincident "bump,bump" of steering wheel. Intensity is increased to reflect greater deviation. *[Note; frequency of bump alert also reflects vehicle speed – hence time to potential road departure].* Control of the vehicle is not removed from the driver and the phone call is not interrupted, since this in itself could create a hazardous distraction.

If time to potential road departure is very short (derived from speed & change in lateral position) then first alert is omitted and high level alarm immediately presented.

Scenario 3a – Drowsy Driver - Roadway Departure

Demonstrates – drowsy driver alert via verbal choices, temporal escalation on repeated transgression, roadway departure alarm via information.

Driver moving along straight two-lane highway at night. System determines *(via video analysis of facial expression, steering wheel grip, shoulder droop ?)* that driver is drowsy *(also uses data on time of day, journey length, last time engine turned off - to increase confidence in conclusion).* System speaks to driver and gives choices to increase level of arousal ; "would you like the radio on ? *"[says what is currently available that driver might like based on personal preferences],* "or the temperature adjusted ? or the seat

massage system to operate" (if fitted) thus waking up driver and getting him to make a choice.
[Intention is to increase cognitive demand]

System detects this poor lane following over an extended period of time *(repeated transgression)* driver advocate speaks to driver with recommendation to take a break and suggests upcoming hotels or restaurants (depending on time of day).

He does not respond and moments later, still drowsy, car starts to veer off towards road edge. *(System identifies reducing distance to road edge with no turn indication).*

Alarm now presented to driver ; *[solid red line highlighting road edge location displayed on HUD]* rumble strip alarm via audio system and corresponding vibration through steering wheel, also coming from departure direction supplemented by verbal warning that "driving is erratic". Hazard lights also activated with the alarm to alert other nearby drivers without an advocate system that there is a potential for accident.
Driver corrects course and alarm ceases.

Scenario 3b – Roadway Departure

Demonstrates – drowsy driver alert without choices, temporal escalation on repeated transgression, roadway departure alarm via command.

Driver moving along straight two-lane highway, system determines *(via video analysis of facial expression, steering wheel grip, shoulder droop ?)* that driver is drowsy *(also uses data on time of day, journey length, last time engine turned off - to increase confidence in conclusion).* System turns on radio, gradually increasing the volume, forcing driver to intervene at preferred setting and/or to change station or turn off.
[Intention is to increase cognitive demand]

System detects poor lane following over an extended period of time *(repeated transgression)* driver advocate speaks to driver with verbal suggestion or recommendation to get rest ?

He does not respond and moments later, still drowsy, car starts to veer off towards road edge. *(System identifies reducing distance to road edge with no turn indication).*

Alarm now presented to driver ; *[solid red line highlighting road edge location displayed on HUD]* rumble strip alarm via audio system and corresponding vibration through steering wheel, also coming from departure direction supplemented by verbal warning to"stay in lane". Turns on hazard lights to warn other drivers around of potential impending accident also data link to other cars within vicinity. Driver corrects course and alarm ceases.

Scenario 4 – Prioritisation of alerts

Demonstrates – Prioritisation of multiple alerts, alarm heirarchy

Loss of oil pressure occurs, driver starts to deviate from straight line course whilst talking on cellular phone at the same time as navigation system indicates left turn coming up in 200 yards *(directions also given over the phone, but call continues)* he also approaches too close to vehicle in front and forward collision warning alert is given *(both visual and auditory, get steering wheel vibration to indicate lane departure).* Oil pressure indicator illuminates after immediate driving situation resolved.

Scenario 5 - Personal Portable User Interface

Demonstrates – PPUI, interface to navigation system, system learning, intelligent agent technology.

Experienced driver climbs into rental car fitted with Driver Advocate system. He puts his smart card into a slot in the dashboard and the system downloads his personal preferences from the web and requests confirmation of identity *[voiceprint ?].* Seat automatically adjusts to his preferred position, his personal cellphone number becomes applicable to this vehicle and alerts are set to his criteria.

He requests list of his pre-defined destination addresses from navigation system using voice – address list displayed in full with verbalisation of voicetag abbreviations. He chooses destination – "Sheraton Hotel, Princeton" - *[system calculates route based upon pre-defined preferences].* First turn by turn directions given to driver and he drives away .....

Later, after driving for several hours the system concludes that it may be time for a break *[based upon journey start time & location, driving "demand", distance to go, previous knowledge of preferred rest intervals, current time etc.]* and finds restaurant a couple of miles ahead which fits drivers food/price preferences. Driver advocate suggests a break and asks whether driver would like directions to "Italianis Restaurant". Driver says "yes please" and system calculates route diversion *[without losing original route information].* Driver follows directions and parks car at restaurant.

D.J.Wheatley
User Centered Research
Motorola Labs.

#3-FW Scenario Planning Meeting

From: Remboski Don-G10491
Sent: Redacted
To: Bezek Craig-G14456; Judy Gardner (E-mail 2)
Subject: FW: Scenario Planning Meeting

Latest on Driver Advocate storyboard session. -djr

-----Original Message-----
From: David Wheatley [mailto:David_J_Wheatley-CDW081@email.mot.com]
Sent: Redacted
To: adams; Douros Ken-AKD002; Mike Gardner (axsm10); Judith L Gardner; Jens Nagel; Jambhekar Shrirang-wlsj01; Canavan Jean-AJC012; Harry_Bliss-AHB001; Janet_Cahn-JCAHN1; Mark_Randolph-AMR025; Don_Remboski-G10491; Keith_Bergelt-AKB023; David_J_Wheatley-CDW081
Subject: Scenario Planning Meeting

Driver Advocate team

The scenario planning meeting will be held on the 14 and 15th December in the Manufacturing conference room, 4th floor, Corporate Tower, 1303, E. Algonquin Road, Schaumburg Illinois (IL01)

I will provide further details about the agenda closer to the time but the meetings will last for the full two days. I trust that you all will be able to attend.

Kind Regards

Dave Wheatley
User Centered Research
Motorola Labs
1301 E. Algonquin Road
Schaumburg
Illinois 60196

Tel (847) 538 1577
Fax (847) 576 3240
Mobile (847) 875 0041

MOTOROLA / GM AUDIO TOUR

Audio Effects	Narration
	1. INTRO (35)
	The Digital Revolution is transforming every aspect of life today. And it will revolutionize every facet of the automotive business...how cars will be made, their function in people's lives, the relationship between car companies and their customers.
	The OnStar system has established GM as a pioneer in automotive information technology, but it's just the beginning...the first light of a dawning era in which technology will drive a cycle of innovation unprecedented in history.
	Motorola and General Motors are uniquely positioned for this new era, with Motorola's proven leadership in communications technology, semiconductors, software, automotive electronics and dedication to integrated solutions and General Motors position as the world's leading automobile manufacturer .
	This exhibit introduces General Motors to the world of Digital DNA...Motorola's new generation of intelligent electronics and integrated systems designed for the car, the driver and the manufacturer of the future. It is an introduction to ideas that will enable General Motors and Motorola to work together to revolutionize the vehicle of the future.
	2. MYOSPHERE (1:45)
SFX: Int. car driving on highway. Cell phone rings.	The cellular explosion has already made your car a convenient and busy place for telephone calls. Now Motorola's Myosphere Voice Recognition system takes a giant step into the future...filling more of your personal communication needs while your hands stay right on the wheel...all you have to do is talk.
Man: "Hello?"	
	Myoshere's advanced voice recognition system gives you your own personal communications assistant, Maya. When you want to make a call or a page, get the news, weather or travel information, just ask Maya and she'll take care of it.
Montage of Myosphere transactions from Maya demo	[MAYA - :20]

Maya demo under

Maya returns for additional instructions after each operation, so there is no need to hang up.

Brief Maya demo montage: successive calls & pages

[MAYA - :10]

Maya and the Myosphere system are available now from Motorola, accessible from any telephone. And Maya will soon have expanded resources at her digital fingertips.

Voice to text and text to voice systems now in development will allow Maya to read your email to you as you drive, even convert your spoken messages into email and deliver it over the internet.

Tag with Maya greeting or sign-off.

SFX: Montage of cell phone beep tones, pager signals, fingers on computer keyboard, etc.

3. SYNCHRONIZATION (1:30)

Our lives are becoming filled with individual information collections...in sophisticated cell phones, pagers, in-vehicle databases, and in the computers and Personal Digital Assistants we rely on every day.

Now Motorola's TrueSync software allows all these information management devices to communicate with each other and with the master network server, synchronizing all their data... from address books to appointment calendars and more. The advantages are powerful...

SFX: Cell phone hang-up beep tones

.....

Man: (on cell phone) "Well, if that's the only time he can see me, I'll just change my schedule and be there."

(hangs up)

Key sounds & beep tones (inputting calendar)

Man: (to himself as he updates calendar) "Here goes today's Schedule."

.....

SFX: Cross fade to car interior, highway noise in bkd.

As he enters the schedule change in his electric organizer, the update is available to everyone in his personal network, instantly.

.....

Cell phone rings.
Beep tone as he answers.

Sec: (through cell phone) This is Tracy. I checked your calendar and saw the new ten o'clock. I'm making some calls to see if we can rearrange your afternoon appointments. I think we can...(audio fades under narrator.)

Secretary dialogue under and fade out.

.....

As cellular bandwidth increases, TrueSync will deliver even more information directly to drivers...total access to the latest data, hands-free.

4. CELL PHONES (1:50)

Motorola has been a leader in cellular technology and design since the cellular system was created, and new features, now in development, will have a major impact on the future of hands-free, in-car communications.

Microphones are a key factor in the evolution of hands-free systems. The less background noise they pick up, the more accurate voice-recognition software can be.

Motorola is developing new microphone technology that can make cellular conversation from high-noise environments like your car as clear as talk from a quiet room.

Edited from MIC test CD:

Fade in SFX: Loop of field test "Motorola" background noise

This field test shows the dramatic difference between this new breakthrough and today's standard cell phone microphone. This call was made on a cell speakerphone from a moving vehicle.

//"Okay, this is the CDMA phone in analog mode with the standard Motorola mike. And we'll be testing the BNS mike against this one while we're going 55 miles and hour."//

.....

.....

SFX: Loop of "Motorola" background noise

The Background Noise Suppression Microphone, (BNS Mike) in this test is a prototype

//"...We're going to test it with the radio on. Approximately volume level 7. We're on the Motorola mike right now... Now we're switching to the BNS microphone. "And back to the Motorola... And back to the BNS. This is

.....

with fan on, radio on, and window cracked."//

SFX: "BNS" background noise loop.
Slowly
SFX: Fade out slowly.

.....

This is a revolution in clarity for cellular voice communications, and a key link in Motorola's evolving world of hands-free communications.

Cell phone design is evolving, too. A new generation of Motorola phones can be configured as accessories for individual automobile brands...in colors and finishes to match a car's interior, with prominent logo placement to reinforce brand image both in and out of the car.

Inside and outside, Motorola cellulars deliver the future of the car phone.

5. MOBILE INTERNET EXCHANGE (1:20)

Real-time, universal access to all the information and communications you need...from your computer or network, through the internet and other providers. It's not a futurist fantasy, its Motorola's Mobile Internet Exchange: MIX.

MIX's information management, messaging and content applications are bundled with Motorola's TrueSync Plus synchronization software. And they can be input on virtually every access device: from cell phones and pagers, to personal digital assistants and wireless PC's. All the information and messaging you need, whenever and wherever you need it.

This Web server-based system is the latest step in Motorola's march toward a pervasive, seamless computing environment. Start listening to your email in the car, then finish up on your laptop. Begin a business letter on your office PC and finish it on your Personal Digital Assistant wherever you have time. MIX will keep track of where you are in the process, so you can continue working, with no obstacles.

The MIX system is also a solid business opportunity. Packaging content for customers, via MIX, can represent a new, high-potential revenue stream for automobile manufacturers.

6. SATELLITE DIGITAL RADIO SERVICE (1:10)

Choose exactly what you want to hear on your car radio...music, entertainment, specific news content, education. By 2001, the Satellite Digital Audio Radio Service will let listener's access a wide variety of unique programming with digital audio quality. As the system develops and iRadio come on line, the choices will be as individual as we are...

SFX: Brief white noise

Music: Classical (:04)
SFX: Brief white noise
VOICE: Baseball play-by-play
SFX: Brief white noise
Music: Rock (:04)
VOICE: *"The market closed up 5 points today on mixed trading."*
SFX: Brief white noise
VOICE: *"In the 19th century, this trend emerged as the new reality."*
SFX: Brief white noise
VOICE: *"...And the duck said, 'I thought he was with you!'" (laughter)*
SFX: Brief white noise

With Motorola's Satellite Digital Radio receivers, you'll be able to receive custom programming in your car, your home, even on a portable radio.

Satellite Digital Radio continues Motorola's leadership in radio frequency technology, giving manufacturers and their customers the best of this exciting technology and eventually a source of personalized information and entertainment.

7. DRIVER INTERFACE (1:10)

As you can see throughout this exhibit, a flood of new in-car communications and information resources is on the way. So Motorola is now developing a whole new driver interface to manage this expanded technology effectively and safely.

Video displays will provide a clear view of driving

conditions on all sides of the car, and infrared enhanced video could make night driving clear as day.

Smart cards, similar to today's ATM cards, will handle tolls and parking, and even store preferred cockpit settings, enabling the car to reset itself instantly to a driver's personal preferences.

Haptic feedback will silently alert the driver to potential driving hazards with tactile stimulation, like a vibrating steering wheel.

The Driver Rating System will analyze input from the car's full array of sensors, and provide instant visual feedback on the driver's performance behind the wheel.

Motorola's long experience in integrating individual technologies into effective systems ensures that drivers will experience this new world of automotive information through an interface designed with them in mind.

8. DRIVER ADVOCATE (1:20)

Motorola's Driver Advocate system will monitor all driving and information systems and intervene, if necessary, to help focus the driver on the most vital task at hand. A key safety feature in the information loaded cars of the future.

The Driver Advocate will be able to access the full range of driving and hazard data, including driver operations, navigation locater systems, external video, perhaps even low-powered radar.

MALE VOICE: "Factoring in the available market data..."
SFX: Beep tone
COMPUTER VOICE: "Alert. Do not steer to the right. A car is too close."

When it analyzes a potential problem, the Driver Advocate will alert the driver using visual displays, haptic signals, or audio interruptions of cellular conversation or infotainment programming.

SFX: Beep tone
DRIVER VOICE: "You've reached Don's car phone. I'm driving right now. Please hold and I'll pick up in a moment."

The Advocate will even control the driver's access to non-driving systems when safety calls for it.

With the Driver Advocate on board, the car of the future will be able to deliver the full spectrum of

technology options and help protect the driver who uses them.

9. EXTERNAL MONITORING

The futurist ideal of a car that safely drives itself is still many years away, but Motorola is already developing key technologies that will soon move automotive safety in that direction.

Motorola's crash avoidance and intelligent cruise-control systems will use a diverse set of sensors to monitor the vehicle's driving environment, including video, ultrasonic detectors, microwave radar and laser range finders.

Integrating this wealth of information into a comprehensive, real-time view of the car's situation, crash avoidance systems will alert the driver and help him respond to developing dangers, while the intelligent cruise-control will automatically speed up or slow down as needed.

Much of the needed sensor technology has already been developed, and Motorola is now focusing on integrating these systems into an affordable package.

10. CAR TO CAR CHAT ( )

Motorola is developing many innovative applications of cellular technology, but vehicle-to-vehicle communications may have the greatest human impact.

Soon you'll be able to call other cars directly, even if you don't know their cell phone numbers. Much like the CB radio culture 20 years ago, this will deliver important safety benefits...drivers can alert each other to problems with their vehicles or road conditions, and call for help if needed.

Integrating new computer capabilities with the cellular infrastructure will lead to valuable new opportunities, like car-to-car chat groups, modeled on similar internet programs. Drivers could be linked in large "conference calls," connecting those with similar interests, the make of the car you drive, the highway you're driving on, even business and investment topics.

Privacy and Caller ID features will protect the

security of each user.

The car-to-car system could transform today's highways full of anonymous and often isolated motorists, into vital communities of drivers, connected by mutual interests and their cell phones.

11. ELECTROMAGNETIC VALVES (1:10)

Replacing mechanical valves with electromagnetic ones has been discussed for many years. Now, current and emerging trends in the automotive industry make the advantages of electromagnetic valves even more and more important.

Electromagnetic valves will offer much more precise valve timing, and they may also eliminate a number of the mechanical components required by today's valve systems, from camshafts to intake throttles. That will bring new engines that are simpler and cheaper to build.

That simplicity combined with their electronic valve control makes them the first choice for the coming generation of Hybrid Electric Vehicles.

The performance benefits of electromagnetic valves...improved horsepower, torque, fuel efficiency and emissions...will be particularly valuable in the large vehicle market. Tomorrow's Sport Utility Vehicles can give drivers the power they want with much better fuel economy, while meeting increasingly stringent emission standards.

Motorola is working to incorporate cost efficient electromagnetic valves as key elements in their sophisticated engine control systems of the future.

12. ALTERNATE PROPULSION (1:00)

Alternate propulsion technology will be moving from prototype to production in only a few years. But Hybrid Electronics and other low emission vehicles will need a higher level of control electronics to be successful.

Motorola, already a leader in control systems, is creating a new generation of semiconductors and microprocessors to meet the challenges of alternate propulsion.

As the graphic in this sphere shows, by the year 2003, the new HIPER semiconductor will reach an operating speed of 300 megahertz, an incredible advance. Its "system on a chip" technology will incorporate generous flash memory and over 35 million transistors...all on a single microchip.

Joined with Motorola's new family of PowerPC microprocessors, they represent a digital breakthrough...true high performance computing designed specifically for the high temperature environment and special needs of tomorrow's propulsion systems.

13. ALTERNATE PROPULSION AND THE ENVIRONMENT (1:00)

Today's movement toward a cleaner environment will see real results in the new millenium, and Motorola is helping achieve those results in three ways.

We are committed to reducing energy and water consumption and harmful emissions in our manufacturing processes. An ongoing program is reducing the use of hazardous materials in our products. So customers using Motorola components will be able to bring more environmentally friendly cars to market.

And Motorola has taken a lead role in developing alternate propulsion vehicles, like GM's EV1, which will dramatically cut automotive emissions. Digital DNA technology is driving rapid progress in our powertrain and charger systems...for example, a motor controller that began as an unwieldy 400 pound unit will soon be the size of a shoebox.

A better environment through cleaner manufacturing, less hazardous products and viable alternate propulsion vehicles...that's the Motorola way.

14. BODY ELECTRONICS (1:10)

Today's body electronics have enabled manufacturers to incorporate sophisticated control of basic systems in cars of every price range. And premium features, like personalized driver settings, help define the brand image of upscale

lines.

Motorola has been instrumental in developing these body electronic systems, and is aggressively working to advance their capabilities and cost effectiveness.

The concept shown here can reduce both the volume of wire and the size of wire harnesses in future cars. This approach is remarkably flexible and easily customized...devices can be added or removed by simply reprogramming the data network, without changing the wiring configuration.

New prototyping tools also allow body electronics Data networks to be assembled with prototype modules and thoroughly tested far earlier in the design process.

Motorola is currently working with GM on body electronics concepts for the Next Generation Vehicle project, the kind of early collaboration that Motorola believes can both improve reliability and lower manufacturing costs of new body electronic systems.

15. SMART SUSPENSION (1:15)

The fantasy vehicle that handles like a sports car and rides like a luxury sedan may become a reality in the next decade, thanks to Smart Suspension systems Motorola is currently developing.

Electronic sensors in the suspension and major mechanical systems will collect precise data on the forces at work on a moving vehicle...from the basics like wheel speed, brake pressure and steering wheel angle, to finer points of roll, pitch, yaw, and lateral acceleration. Information from collision avoidance systems may also be routed into the system.

Proprietary software running on a powerful new generation of Motorola computers will process this data and transmit adjustments back to control units in the suspension.

Rapid prototyping features will enable early development and troubleshooting, leading to cost-effective production.

Whether correcting for skids and over steering, or adjusting the car to handle difficult terrain, the Smart Suspension will resolve the conflicts between handling and ride, safety and comfort...in a new driving experience. Amid a new source of competitive advantage for car manufacturers in the new millennium.

16. IDB FORUM (1:10)

For consumers to take advantage of the full range of a communication opportunities which will coming to their lives...and their cars...in the years ahead, there must be an effective network interface standard embraced by automotive manufacturers and electronic suppliers.

Motorola has taken a leadership role in the IDB Forum, an international organization working to design and establish such a universal interface.

Within 10 years the IDB portal will be standard equipment worldwide, allowing every vehicle to connect with a range of devices, that will allow consumers to configure and update their automotive electronics as simply as they do the PC's on their desks.

Compatibility and design cycle disparities will be a thing of the past, and IDB-based telematics, multimedia and infotainment systems will be as prevalent as power windows are today.

Then Motorola's vision of a seamless flow of communication and information between your car and the rest of your life will be a reality.

17. ACCOMODATED DEVICES (1:00)

The IDB interface and Motorola's TrueSync software will allow wireless devices to seamlessly network with your car and each other...sharing information and taking full advantage of the vehicle's systems.

And Motorola is now developing a vehicle access point for these devices that can be much more than just a place to plug in.

The digital access point will include a firewall to shield the car's critical internal functions from accidental disruption by any external device

hooked into its network.

And it can be programmed to function as a gateway, admitting only selected devices into the network. This feature will allow car companies to license access to their vehicles' electronic systems and their proprietary software networks. As car-based communications become common over the next decade, the license fees paid by manufacturers of wireless devices and end users can become significant additional revenue streams.

18. GLOBAL STANDARDS (1:00)

As you can see in Motorola's evolving world of Digital DNA, the potential of advanced electronic systems is vast.

Wireless communications, in-vehicle data networks, telematics, infotainment...companies who commit to these innovations and create effective strategies to maximize their market value will reap the benefits far into the next century. But establishing global standards is the key to long term profitability of these new systems.

Motorola has taken the lead in international efforts to set global standards and business strategies to support them. Once these standards are in place, both auto manufacturers and electronics suppliers can focus on developing cost-effective cross-platform technology for customers.

From basic and applied technology, to integrated system design and industry leadership...Motorola is ready for the new world of automotive electronics, and ready to join with General Motors to keep GM vehicles on the leading edge of the new digital world.

19. POWERTRAIN SYSTEMS (:50)

Electronic control of the powertrain system is standard in today's cars, and in the coming years it will evolve into even more sophisticated forms.

The Electronic Control Unit, or ECU, is the brains of engine management, and it's also a prime factor in the overall cost of the powertrain system. A higher performance ECU can enable less costly mechanical components to be used.

But these potential cost savings are often lost

due to supplier policies that bundle the ECU with other components, requiring manufacturers to buy less cost-effective parts in order to get the component they actually want.

Motorola is a leader in engine control electronics and an independent supplier, well equipped to function as a system integrator of powertrain systems. By assembling the best and most cost-effective components from a variety of manufacturers, together with our superior ECU's, Motorola can deliver the best powertrain systems for individual applications at the best price.

20.CAR DISPLAY

Motorola's Digital DNA systems will play key roles in the car of the future...think of it as the "Dot-Car."

It's an exciting idea today, but within a decade the Dot-Car will be cruising down highways, providing unprecedented levels of communication, information, performance and safety to the passengers inside.

High capacity wireless communications will shower down a digital rain of information and entertainment, much of it provided by the automotive company itself. Inside the Dot-Car, an integrated network of Motorola systems will channel this downpour into a menu of services tailored to meet the needs of the individual driver and passengers.

Under the hood, more advanced Motorola technology will deliver higher performance and fuel economy, better handling with the Smart Suspension system, and safer driving with a network of external sensors and anti-collision Features.

As you have experienced each sphere in this exhibit of Digital DNA, you discovered another piece of this remarkable system that Motorola is building today. In this room you are seeing the intelligent technology from Motorola that will allow you to transform the Dot-Car from an idea on the wall to a car on the road, within the next ten years.

#5-MOTOROaudio - Microsoft Word

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Type a question for help

100% Out-of-Sight

Normal + Arial, Arial 10

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MOTOROLA / GM AUDIO TOUR

Audio Effects	Narration
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